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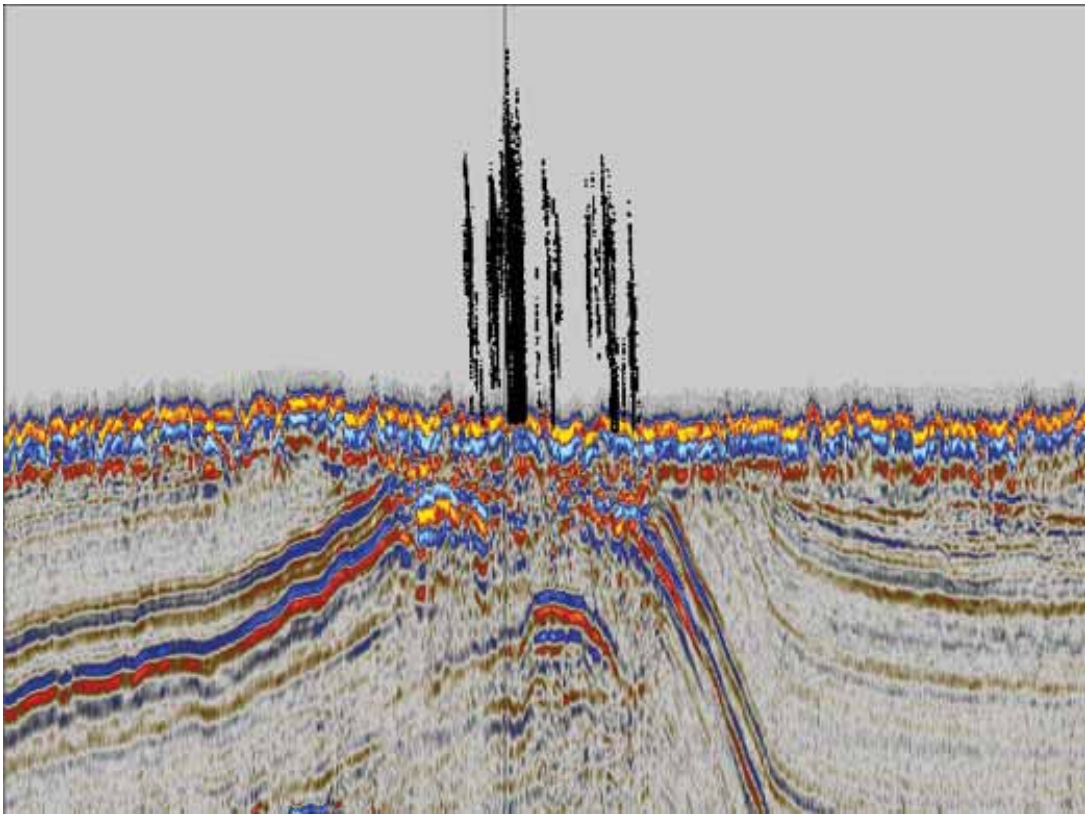
CAGE19-2 Cruise Report

R/V Helmer Hanssen 09. – 23. July
Longyearbyen – Longyearbyen

Hunting gas flares and launching seafloor observatory

Chief Scientist: Karin Andreassen; Capt. R/V: Per Kristian Langaune
Report prepared by: Karin Andreassen, Henry Patton, Rune Mattingsdal, Manuel Moser, Frances Cooke, Për Jansson, Claudio Argentino



Key words: Gas flares, multibeam, seismic, oceanographic observatory
Cite as: Andreassen, K. et al., "*Hunting gas flares and launching seafloor observatory*". 2019. 47 pages

Report Outline

page

1. Scientific objectives

The cruise was part of the Centre of Excellence(SFF) *Centre for Arctic Gas Hydrate. Environment and Climate Climate (CAGE)* at UiT - The Arctic University of Norway. It was partly supported by The Norwegian Petroleum Directory (NPD).

The cruise had the following scientific objectives:

- Identification of gas seepage associated with assumed hydrocarbon reservoirs subcropping the sea floor due to erosion of overlying cap rocks
- Identification of gas seepage related to leakage along faults breaching the seafloor.
- Acqusition of multibeam, subbottom profiler-, seismic data and samples of gas in water and sediments for cross disciplinary investigations by CAGE
- Deployment of seafloor observatory and oceanographic studies west of Prins Kars Forland

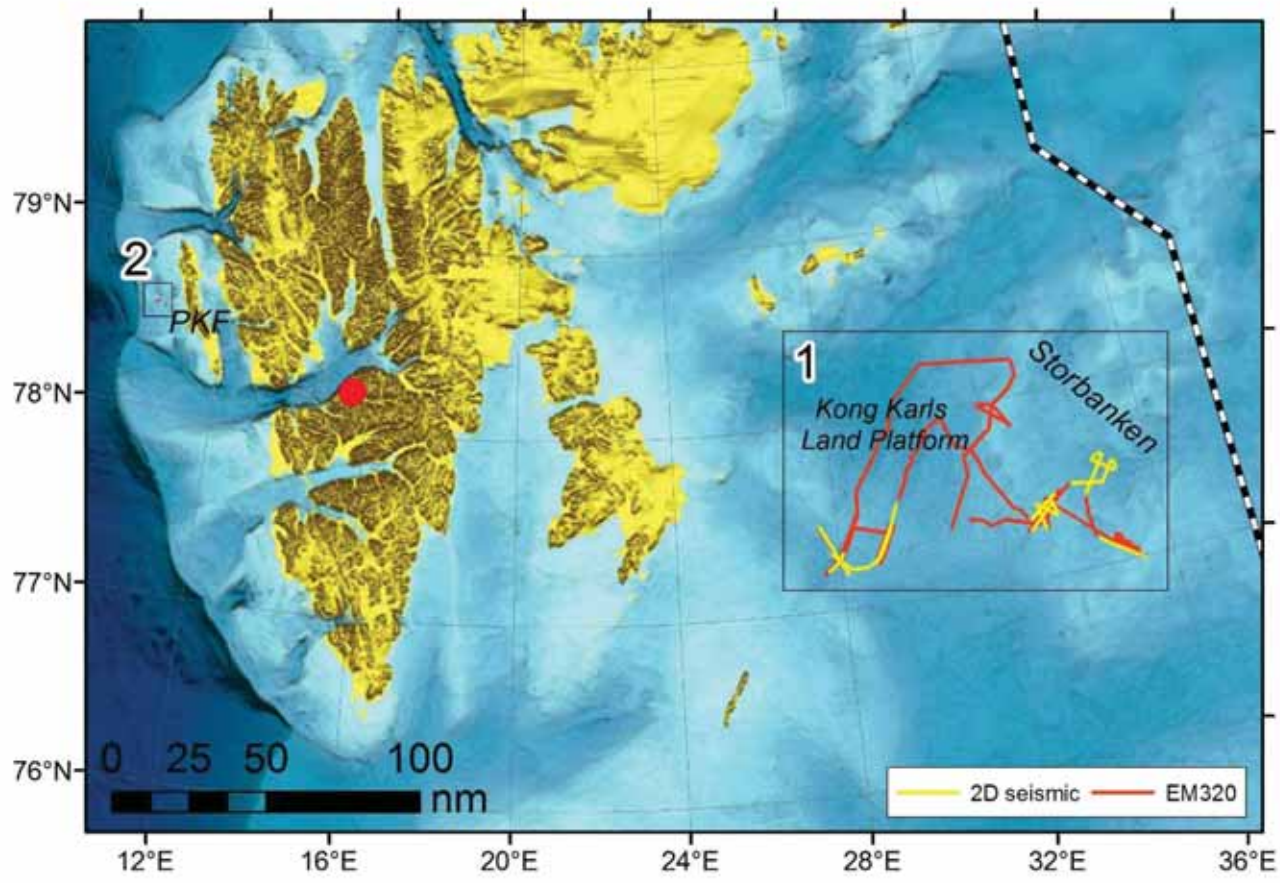


Figure 1. Map showing working areas for cruise CAGE19-2. 1: Kong Karls Land Platform (KKLP) and Storbanken; and 2: Offshore of Prins Karls Forland (PKF).

2. Cruise participants

Karin Andreassen sh1	Professor UiT/CAGE (cruise leader)
Rune Mattingsdal sh1	Geologist NPD (advising, planning surveys)
Henry Patton sh1	Researcher CAGE (data logging)
Cladio Argentino sh2	PostDoc CAGE (porewater, gas in sediments)
Matteus Lindgren sh2	Lab. Engineer CAGE (porewater, gas in sediments)
Për Jansson sh2	Researcher CAGE (oceanography)
Manuel Moser sh1	PhD CAGE (multibeam processing)
Frances Ann Cooke sh1	PhD CAGE (seismic processing)
Przemuslaw Domel sh2	PhD CAGE (seismic + multibeam acquisition)
Griselda Anglada-Ortiz sh2	PhD CAGE (various tasks)
Aleksei Kishankov sh1	PhD Gupkin Univ, Russia (various tasks)
Purohit Vishal sh2	Intern student Indian Institute of Technology Roorkee India (various tasks)
Vashisth Divakar sh1	Intern student Indian Institute of Technology Dhanbad India (various tasks)
Lone Smelror open sh	Adm. Coordinator CAGE (observer, various tasks)
Torger Grytå open sh	Graphic designer UiT (observer, various tasks)
Steinar Iversen sh2	Engineer (data acquisition and logging)
Truls Holm sh1	Engineer (data acquisition and logging)

Shift 1: 08:00-14:00;20:00-02:00. Shift 2: 14:00:08:00; 02:00.
Departure from Longyearbyen 09.07 at 20:00, transit to Storbanken: ca 40 hrs.
Cruise shifts started Wednesday 10.07 at 08:00, stopped Thursday 18.07 at 21:00.
Picking up Lander in Longyearbyen Saturday 20.07 and departure for Prins Karls Forland
Arriving Longyearbyen after cruise ended Tuesday 23.07 at 07:00.

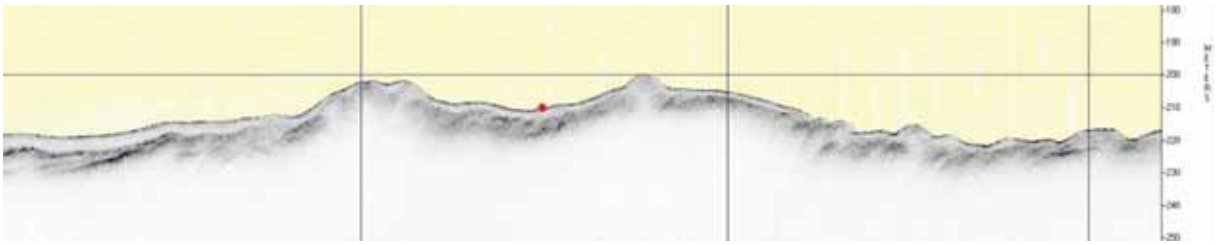
3. Equipment used

3.1. Subbottom Profiler (Chirp)

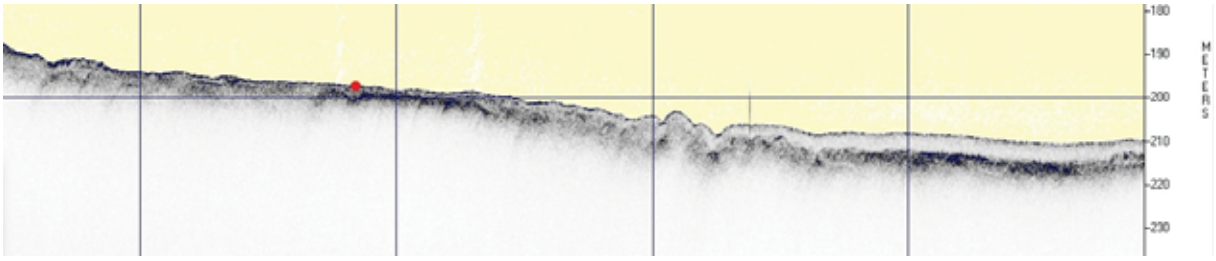
A X-STAR Full Spectrum Sonar is a versatile wideband FM sub-bottom profiler that generates cross-sectional images of the seabed and collects digital normal incidence reflection data over many frequency ranges. X-STAR transmits an FM pulse that is linearly swept over a full spectrum frequency range (also called “chirp pulse”).

The chirp system comprises of a hull-mounted 4 x 4 transducer array operated at an energy level of 4 kW and at a shot rate of 1 s. The signal lasts 40 ms, starts at 1.5 kHz and end at 9 kHz. The system can operate in up to 8000 m of water. The penetration depth depends on the sediment type/thickness, it can be up to 80 m in soft clay.

The chirp was started Wednesday 10.07 at time 10.03 on transit to Storbanken, named Transit1.



Stnr 782 (Gravity corer)



Stnr 784 (Gravity corer), 785 (Multicorer)

Figure 2. Chirp profiles over gravity core stations 782-GC and 784-GC and multi core station 785-MC at KKLP.

3.2. Multibeam Echosounder

Multi-beam echosounders use a swath of beams giving off-track depth. Basic components of a multi-beam system are two linear transducer arrays in a Mills cross configuration with separate units for transmitting and receiving. Echosounders measure the two-way travel time that a sound wave initiated by the transmitter needs to reach the seafloor and be reflected back to the receiver. The time-depth conversion can be done using the sound velocity through seawater calculated from the closest CTD measurements.

R/V Helmer Hanssen is equipped with the hull-mounted Kongsberg Simrad EM302 multi-beam echosounder system. Its nominal sonar frequency of the sound waves is 30 kHz with an angular coverage sector of up to 150° and 432 beams per ping. The system was mainly used with a 60°/60° opening angle. The ping rate depends on the water depth and switched frequently between 0.5 and 2 Hz. The EM302 provides high-resolution bathymetric data up to a water depth of 7000 m. The achievable swath width on the seafloor depends on the bathymetry and the selected opening angle.

During the entire cruise, the EM302 provided continuous bathymetric data to give an overview of seafloor morphology in the study area. The QPS Qimera software was used to create preliminary high-resolution bathymetric maps.

Another application of the EM302 is to monitor the water column. The acquired data were analysed using the QPS FMMidwater software. Before any analysis could be done, the provided sonar source files (*.all, *.wcd) had to be converted to the generic water column file format (*.gwc). The objective of analysing water column data was the detection of acoustic flares indicating gas seepage from the seafloor to the water column and their spatial mapping on top of the bathymetry and along the seismic lines acquired during the cruise. The following steps were carried out to extract the flare data.

a) Identification of acoustic flares in the water column data, either in fan view (left panel) or in R-stack view (right panel).

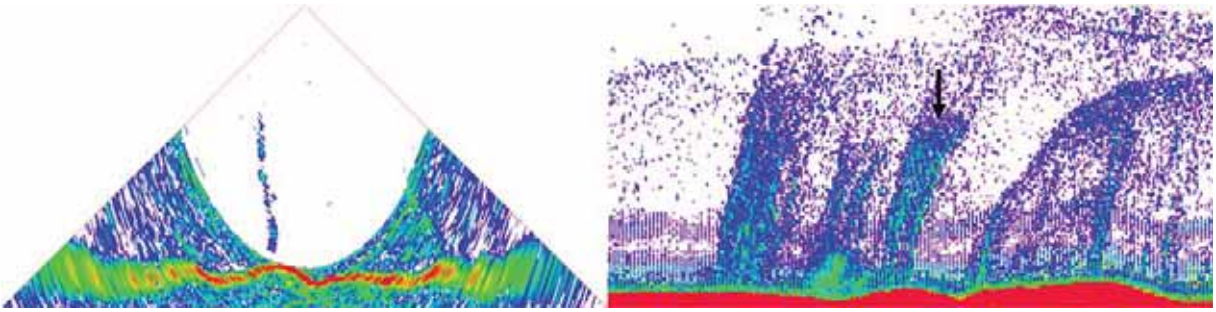


Figure 3. Left: Fan view showing a single flare. Right: R-stack view showing several flares near the flare on the left panel (black arrow). The colormap of the raw amplitude ranges from -90 (blue) to -10 (red) dB.

b) Selection of the flare.
   i. Selection of a reasonable beam range in the fan view.
   ii. Selection of the flare area in the R-stack view.
   iii. Export of the selection as an ASCII file.

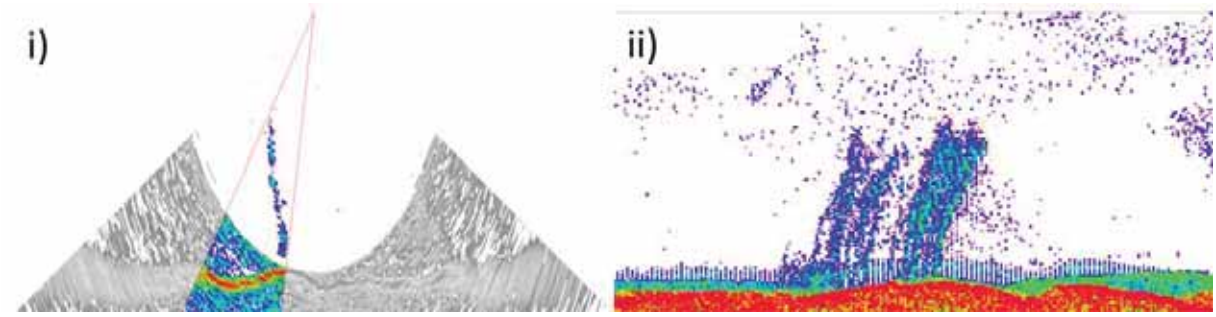


Figure 4. i) Adjustment of the considered beam range. ii) R-stack view for the adjusted beam range. The colormap of the raw amplitude ranges from -90 (blue) to -10 (red) dB.

a) The QPS Fledermaus software allows a three-dimensional view of the exported flare file to be superimposed on the bathymetry.

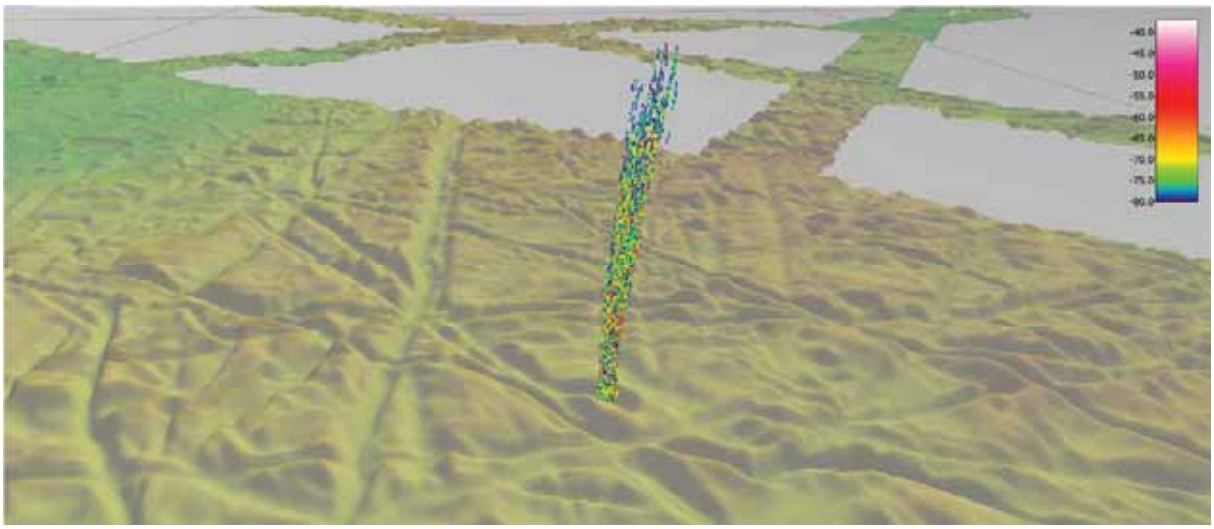


Figure 5. Plot of the acoustic flare superimposed on the bathymetry. The flare is ca. 65 m high. The colormap of the raw amplitude ranges from -80 (blue) to -40 (white) dB.

3.3 CTD

CTD (Conductivity, Temperature, Depth) sensors measure the physical properties of seawater. In addition to measuring the conductivity, temperature and pressure (from which depth is calculated), the CTD sensors measure or calculate salinity of seawater, density, sound velocity, turbidity, fluorescence/chlorophyll, and oxygen content. Furthermore, the CTD deck unit can trigger closing of Niskin bottles at discrete depths. Water samples may be taken from the Niskin bottles for further analysis.

R/V Helmer Hanssen uses SBE 911plus CTD for producing vertical profiles of seawater properties. A winch is used to lower the CTD system into the water. The SBE 911plus CTD can measure physical properties of the seawater from up to eight auxiliary sensors, in marine or fresh-water environments at depths up to 6000 meters. However, the winch wire length limits CTD measurements to approximately 3200 meters. The CTD sensors record data at a rate of 24 samples per second. The 911plus system uses the modular SBE 3plus temperature sensor, SBE 4C conductivity sensor, SBE 5T submersible pump, and TC duct. The submersible pump pumps water along the sensor to measure the conductivity. The TC duct makes sure that temperature and conductivity are measured on the same parcel of water.

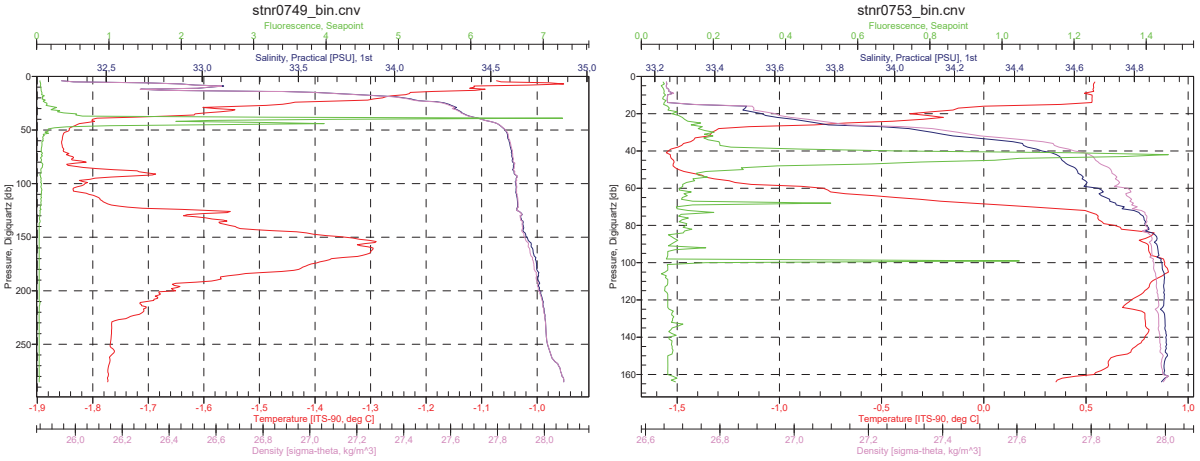


Figure 6. CTD stations 749 and 753 in KKLP and Storbanken west respectively.

3.4. Single Beam Echo sounder

Single beam echo sounders are common among all types of ships. Their primary purpose is to estimate the depth of the seafloor. In a single beam echo sounder, the transducer projects a sound pulse through water in a controlled direction and the reflected wave is received. The depth is calculated from the travel time of the sound pulse. R/V Helmer Hanssen has a keel-mounted Simrad EK 60 single beam echo sounder with transducers at three different frequencies, 18 KHz, 38 KHz and 120 KHz. The 18 KHz transducer can be used for depths up to 10 km whereas 38 KHz and 120 KHz can only be used for depths up to 2 km and 500m respectively. During the cruise, the single beam echo sounder was used to identify gas seepages in to the water column. Rising gas bubbles

appear as high amplitude anomalies within the water column (e.g., Fig.7), referred to as gas flares.

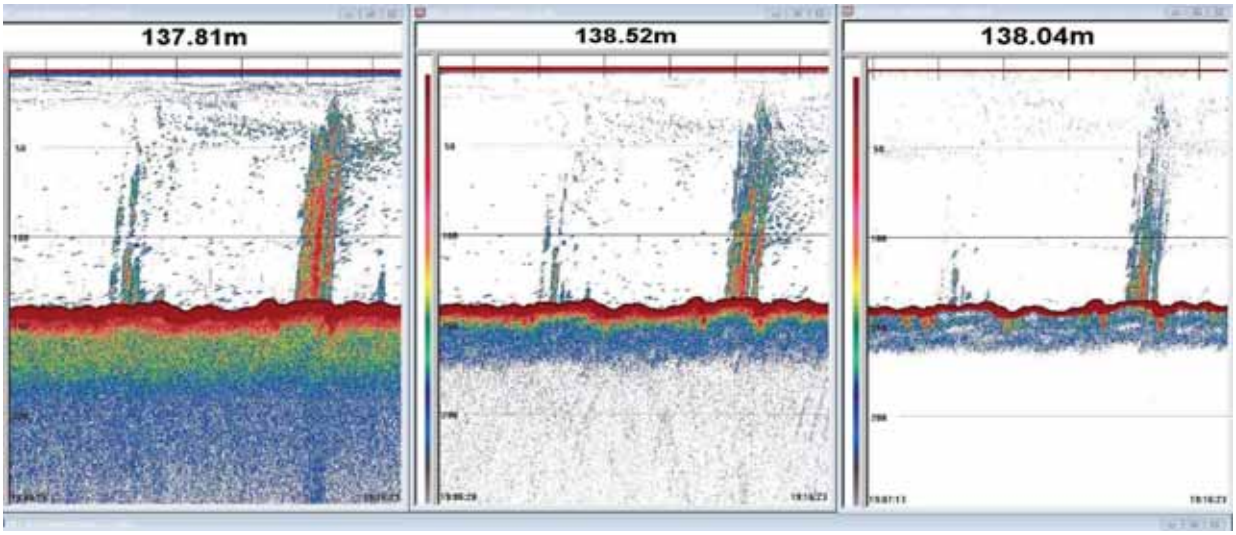


Fig. 7. Single beam echo sounder profile (18 Hz left, 38 Hz middle and 120 Hz right) line 27 on Storbanken with gas flares in the water.

3.5. 2D Reflection Seismic

Source: During 2D seismic acquisition, one GI (Generator-Injector) air gun was used as the seismic source. The air gun generates seismic waves by releasing compressed air into the water. A compressor supplies air at a pressure of 170 bar to the air gun. Shooting rate, sampling rate and other acquisition parameters for each line is listed in the line-log.
Streamer: The streamer used during 2D data acquisition is 100 m long with 32 channels separated by 3.125 m. The streamer is composed of four 25 m long P-Cable Sections.

Operation: The streamer is towed behind the ship at a distance of 68 m from an arm at ~13 m from the centre of the boat. The air gun is towed at a distance of 33 m behind the ship at a depth of approximately 2 mbsl.

See Fig. 8 for geometry of the survey, Table 1 for acquisition parameters and Table 2 for seismic processing flow.

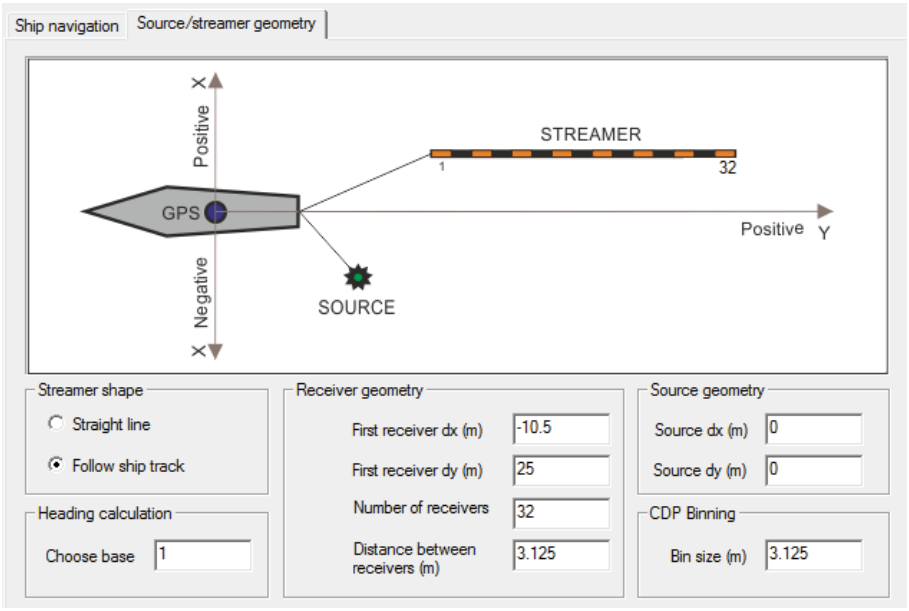


Figure 8. Geometry of the 2D seismic survey. The gun position is used as a reference point for streamer geometry calculation.

We collected 18 2D seismic lines in the Kong Karls Land – Storbanken areas (Fig. 1). The raw data were processed using the RadexPro Professional 2019.1 software. The seismic lines were binned to 3.125m. This binning generated a nominal fold of ca 9-12 traces. The seismic processing flow, as listed in table below, includes: (1) geometry assignment after processing navigation files (using Rowan's python code), with some lines requiring navigation extracted from the Chirp, (2) filtering (channel removal, band-pass, Spherical divergence), (3) debubble, (4) NMO correction, mean stack using water velocity of 1453 m/s (5) denoise (f-x) and (6) post-stack Kirchhoff Migration. The amplitude spectrum (Fig. 9) displays a dominant frequency of 111 Hz for Line 70 (band-pass stage). Figs. 10, 11 and 12 show stacked sections for processing steps 2, 3-5, and 6.

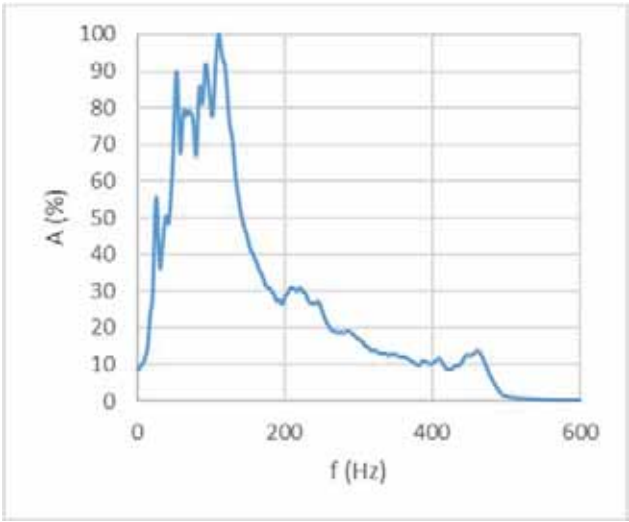


Figure 9. Amplitude Spectrum (band-pass filter) of line 70, between the seafloor at 290ms and sub seafloor at 500ms TWT.

Seismic Acquisition	
Source	1 mini GI 30/30 in^3
Shooting rate	4 s (except line 001, shooting rate 5 s)
Shooting pressure	140 bar
Source towing depth	2 m
Positioning	GPS transponder on gun raft
Streamer length	100m
Number of streamer sections	4
Number of channels	32
Receiver group spacing	3.125
Streamer towing depth	2-3m
Sampling rate/interval	4000Hz/0.25ms
Recording length	3 s

Table 1. Seismic acquisition parameters of seismic lines acquired during CAGE19-2 cruise

Seismic Processing Flow	
SEG-D import and geometry assignment	Input of SEG-D files Geometry assignment and offset calculation
Filtering in the shot gathers	Removal of bad channels Simple band-pass filter of 15/20/450/500 Hz Spherical Divergence
Wavelet Extraction	Extraction of zero phase equivalent wavelet
Debubble	Apply bubble filter and perform deconvolution
NMO and stacking	NMO using constant velocity of 1453 m/s, ensemble stack using mean stack mode
Denoise	FX Predictive Filtering
Migration	Post Stack Kirchhoff Migration, using a constant velocity of 1500 m/s and aperture of 300m
SEG-Y output	IBM floating point CDP_X,4R, IBM, 181/CDP_Y, 4R, IBM, 185 Coordinate system: WGS84-UTM36N

Table 2. Seismic processing flow for seismic lines acquired during CAGE19-2

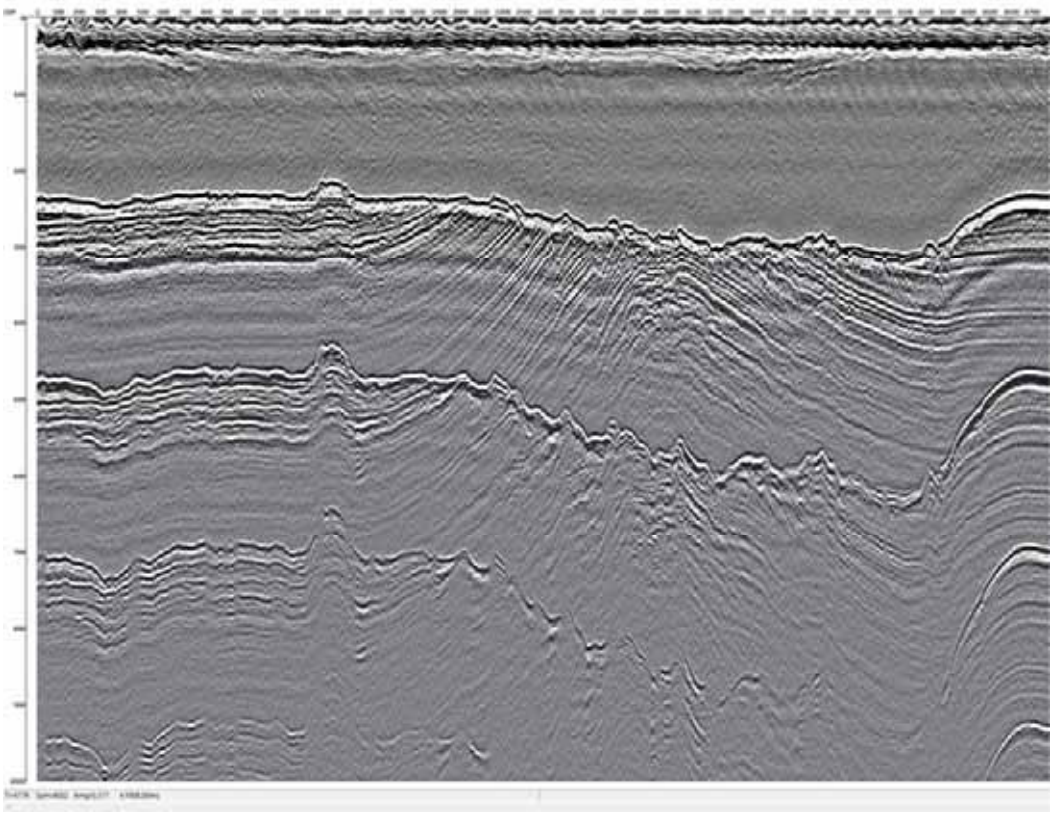


Figure 10. Bandpass and spherical divergence.

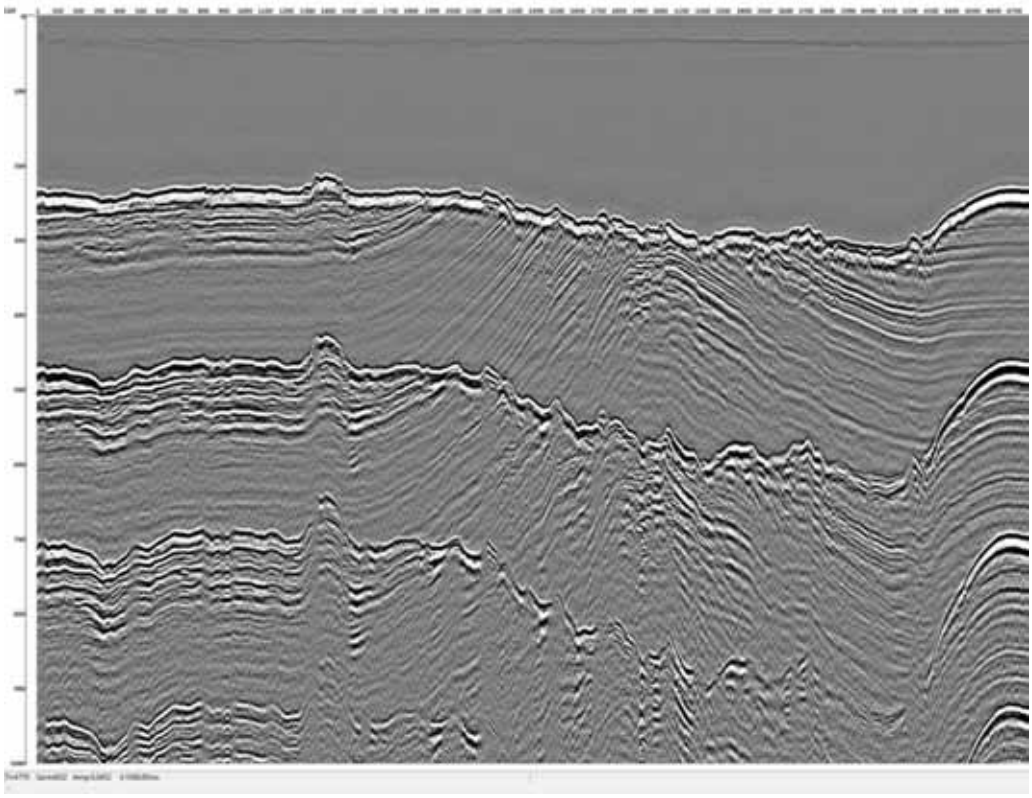


Figure 11. Debubble and F-X denoise filter

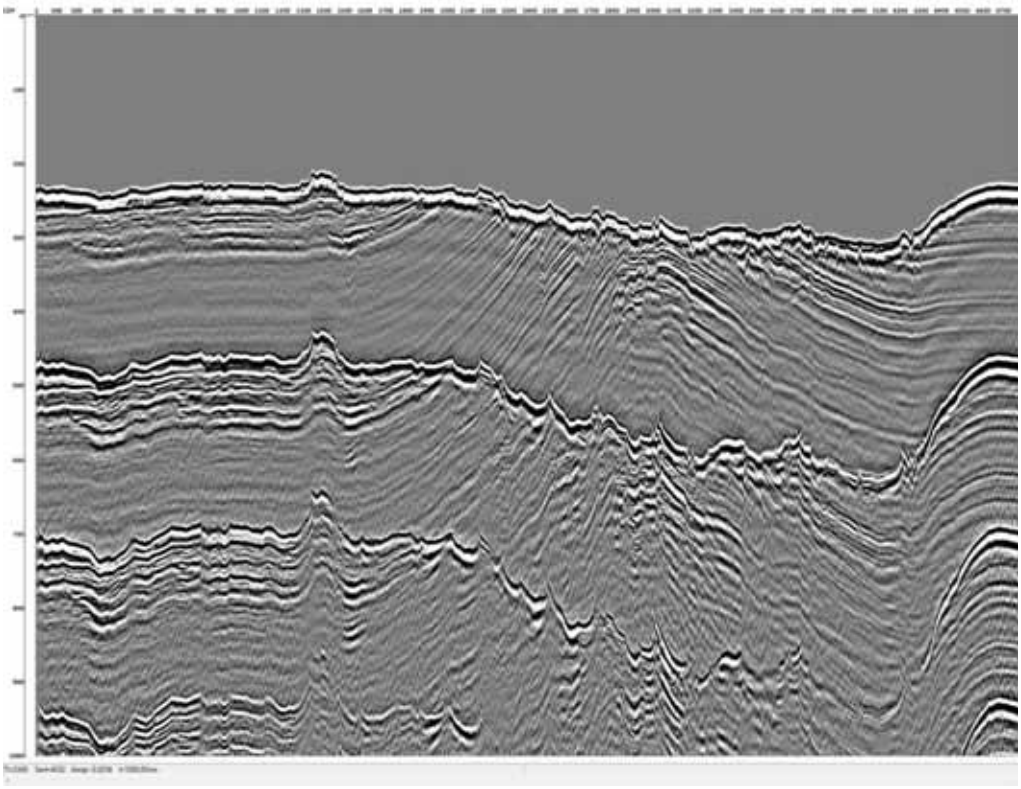


Figure 12. Post-stack Kirchoff Migration and seafloor mute.

3.6. Sediment coring for pore water and gas in the sediment

Sediment cores were sampled with gravity corer (max core length 6m, outer diameter 119 mm) and multi-corer (6 core liners; outer diameter 110mm, length 0.7m). The main objective of the coring was to acquire samples for pore water and gas in the sediment analyses. The core locations were chosen where gas flares are registered in the water from single and multibeam profiles, and the singlebeam is used to guide the coring. Two gravity cores (stations 782, 784) and 2 multi cores (stations 785, 786) were acquired on the Kong Karls Land Platform (KKLP). Chirp profiles were used to check that for sediments at the core locations.

After retrieval of gravity-cores GC782 (0-233 cm) and GC784 (0-48 cm), the plastic liners were cut into sections of up to 100 cm length. They were covered with plastic caps, taped, labelled and stored at 4˚C. Multi-core cores were retrieved at stations 785 and 786. We retrieved 4 cores at station MC785 and 2 cores at station MC786. The maximum core length for MC785 was 56 cm and for MC786 was 42 cm. One core from each station was subsequently sliced and sub-sampled in 1 cm intervals. 1 core from MC786 and 2 cores from MC785 were stored at 4˚C.

Pore water samples were collected from gravity cores GC784 and GC782#1 (0-100 cm section) and from MC785 and MC786. For pore water samples we drilled 3 mm holes into the plastic liner at 1 cm intervals. The sampling resolution for gravity cores was lower (~ 10 cm). After core retrieval we inserted the rhizons with 5 ml or 10 mL syringes attached and then we used spacers to create a vacuum inside the syringes. Pore water samples were extracted by pressure filtration through 0.2 μm cellulose acetate filters. A total of 59 pore water samples were collected and then splitted into 3 aliquots: 1) subsamples for DIC analysis (1 ml) were transferred to 1.5 ml micro tubes with screw caps and added 10 μl of

$HgCl_2$ to stop microbial activity. 2) Subsamples for sulfate analysis (> 1 ml) and for 3) Sr isotopic analysis (> 2 ml) were transferred to 5 ml Eppendorf Tubes ®. Subsamples for Sr investigations were added 10 µl of suprapur grade 65% nitric acid to lower the pH<2 and prevent precipitation of carbonate phases.
A total of 9 sediment samples for headspace gas analysis were collected from GC785 and 1 sample from core catcher sediments of GC782. For headspace gas samples, we drilled holes with a diameter of 1.5 cm into the plastic liners at 5 cm intervals. We used a 5 mL syringe without the luer tip to collect 5 mL of sediments. The sediment sample was transferred to a 20 mL serum vial containing a glass bead and was added 5 mL of 1M NaOH to stop microbial activity. The vial was immediately closed with a septum and an aluminum crimp seal. Pore water and sediment samples were then stored under 4˚C for onshore analyses. Subsamples for sulfate analysis were kept frozen at -20˚C.

Figure 13. Gravity corer (left) and multi-corer (right) used to collect sediments at KKLP.

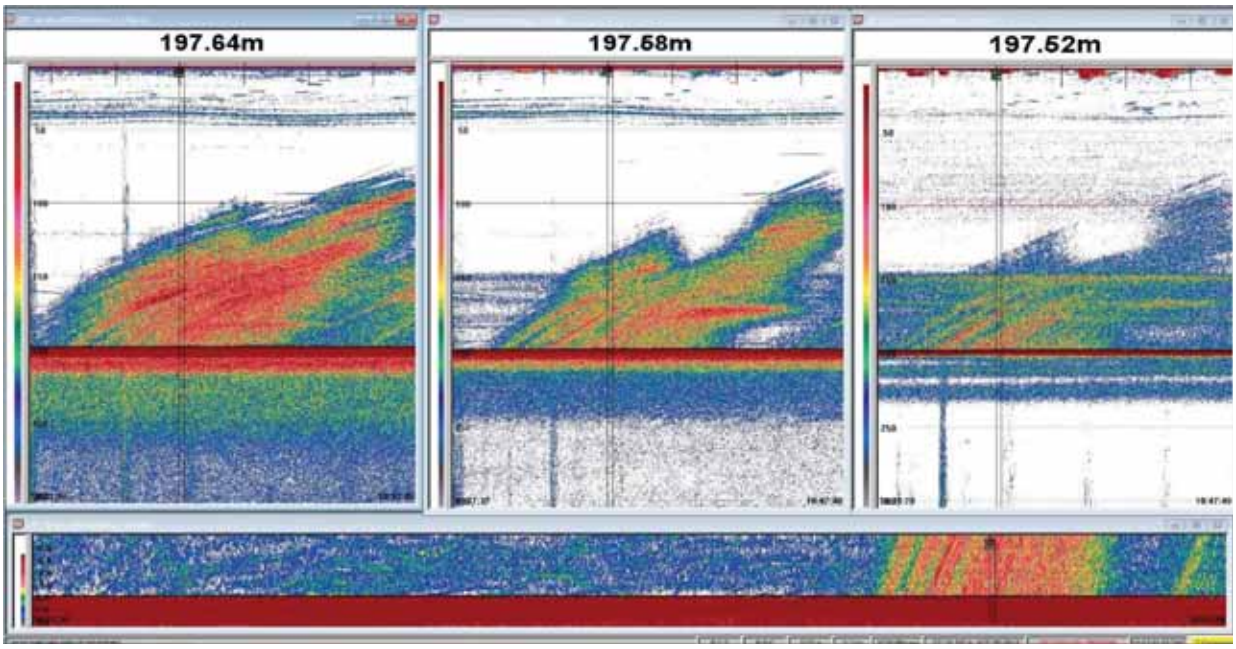


Figure 14. Single beam profiling is used as guide sediment coring for gas in the sediment and pore water; here from multi core station MC785 at KKLP.

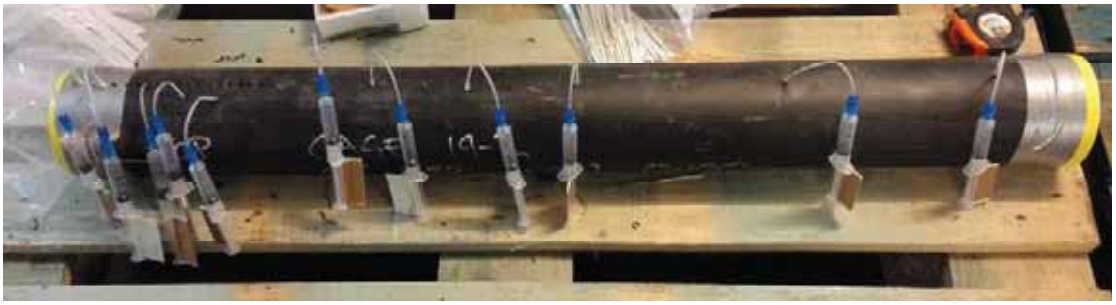


Figure 15. Extraction of pore water samples from gravity core GC782 using rhizons.

4. Study areas and ship tracks

4.1. Kong Karls Land Platform to western Storbanken (area A in Fig. 16).

An overview of multibeam, chirp-, seismic lines and CTD stations that were acquired in the area of Kong Kars Land Platform and western Storbanken is given in Fig. 16, and more details are given in the figures following this.

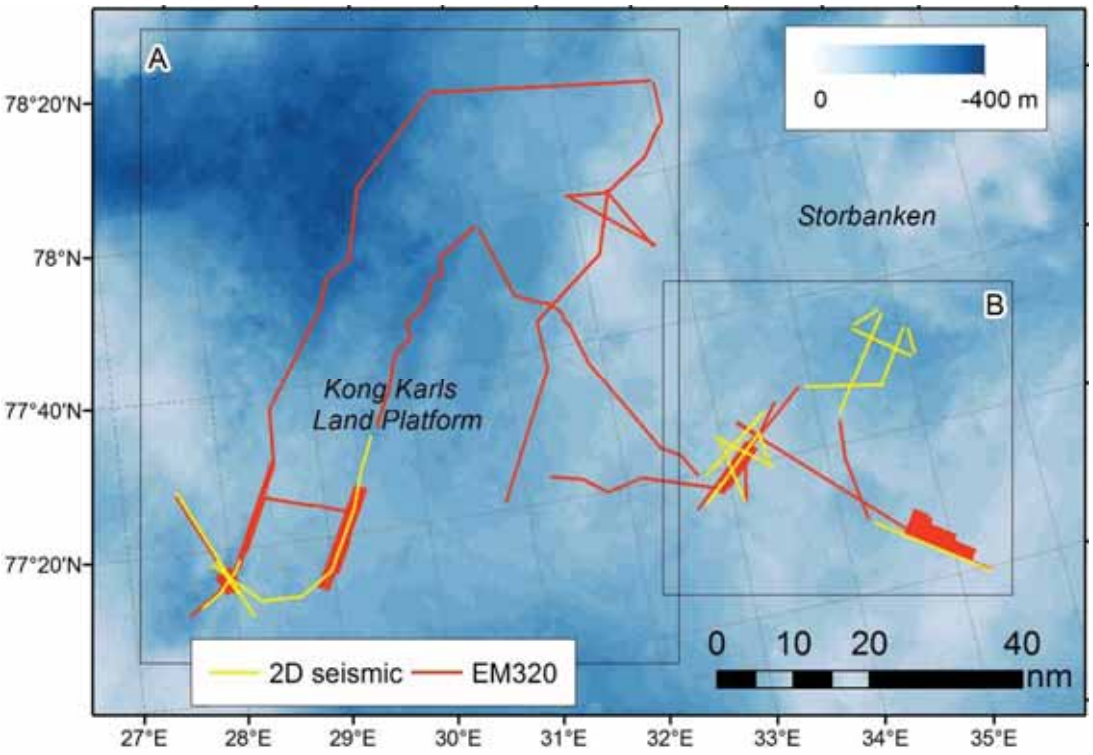


Figure 16. Multibeam, chirp lines, seismic lines and CTD stations on the Kong Karls Land Platform and western Storbanken area are indicated in A.

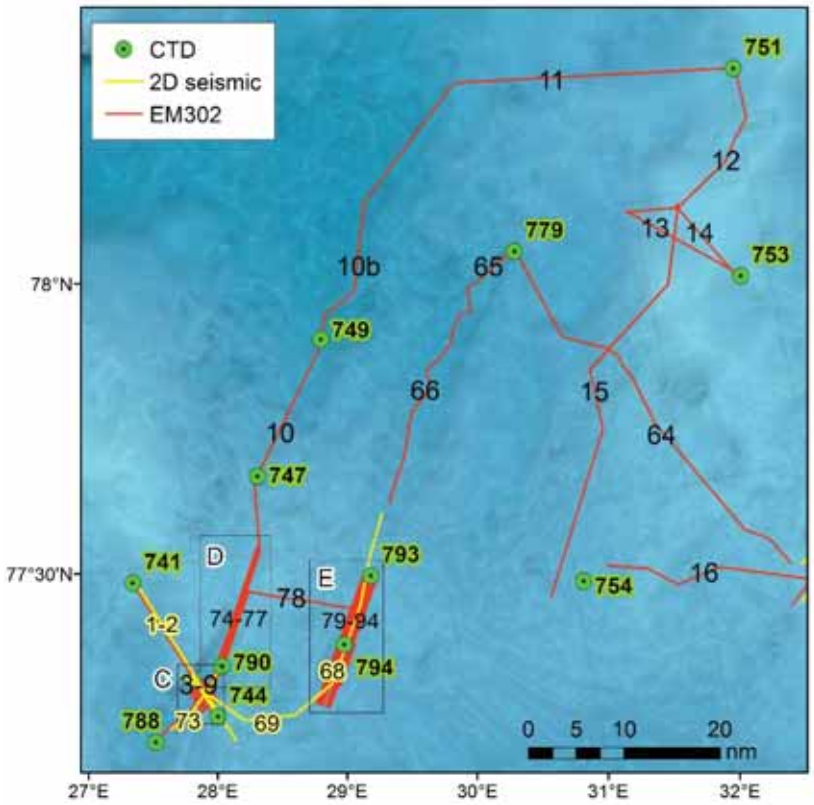


Figure 17. Study area A on Kong Karls Land Platform. Locations of multibeam, chirp-, seismic lines and CTD stations.

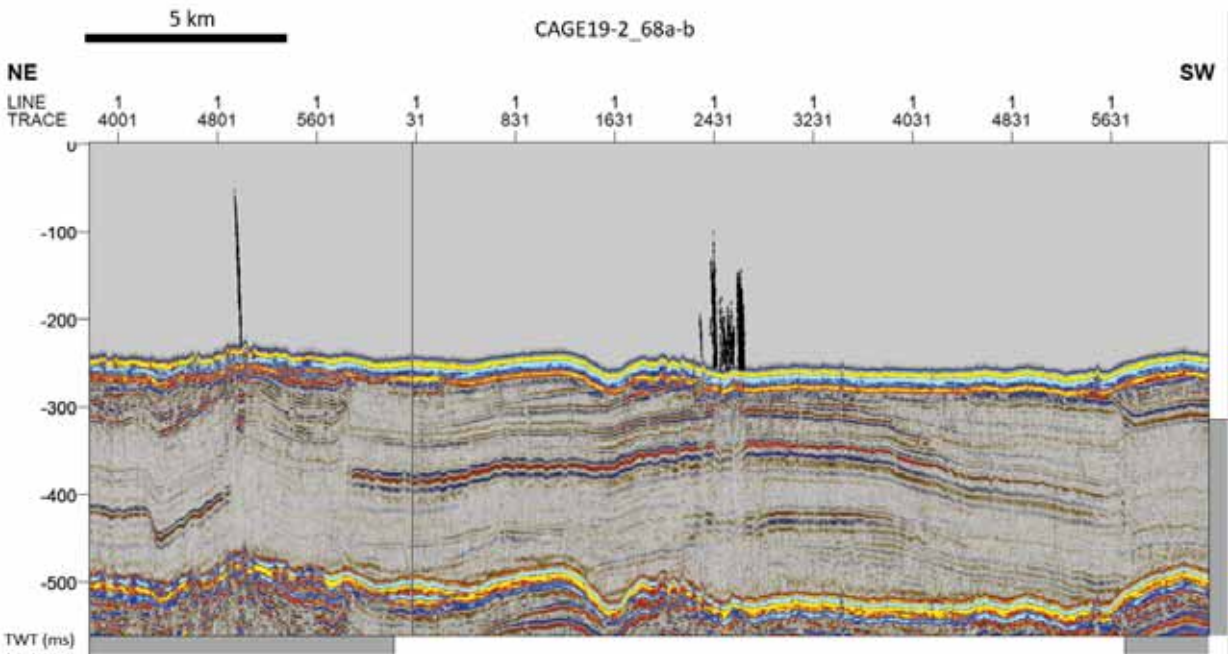


Figure 18. Seismic line 68 in area E on Kong Karls Land Platform with gas flares superimposed.

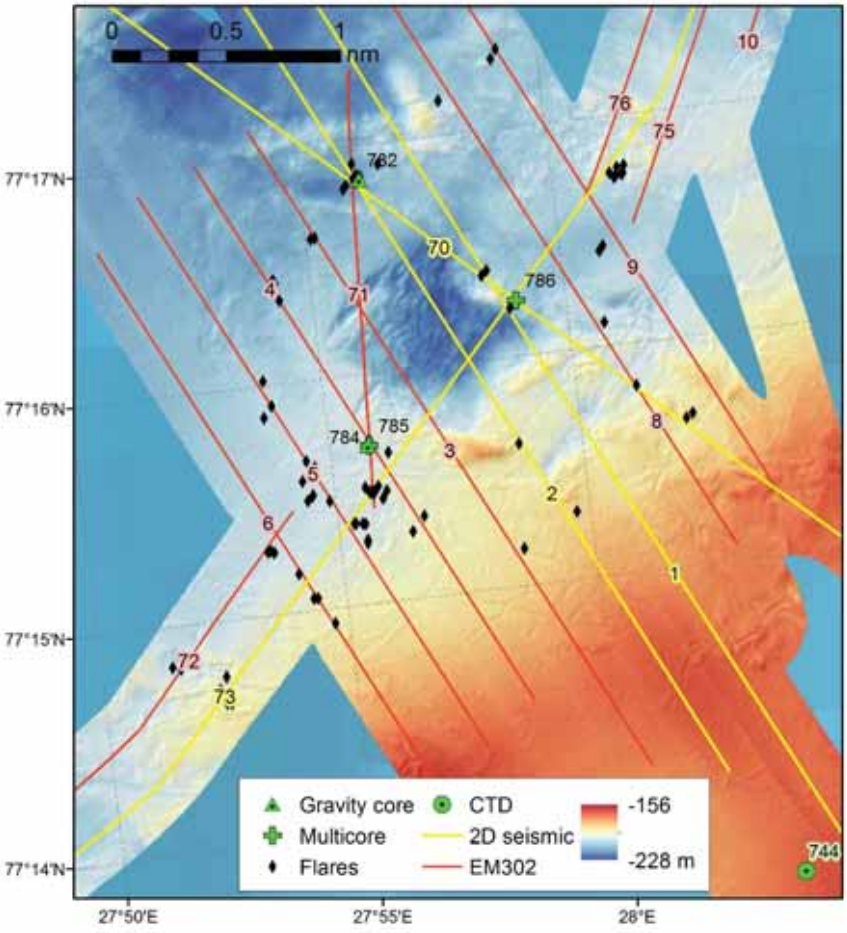


Figure 19. Multibeam, chirp-, seismic lines and CTD stations in study area C on Kong Karls Land Platform as indicated in overview Fig. 17.

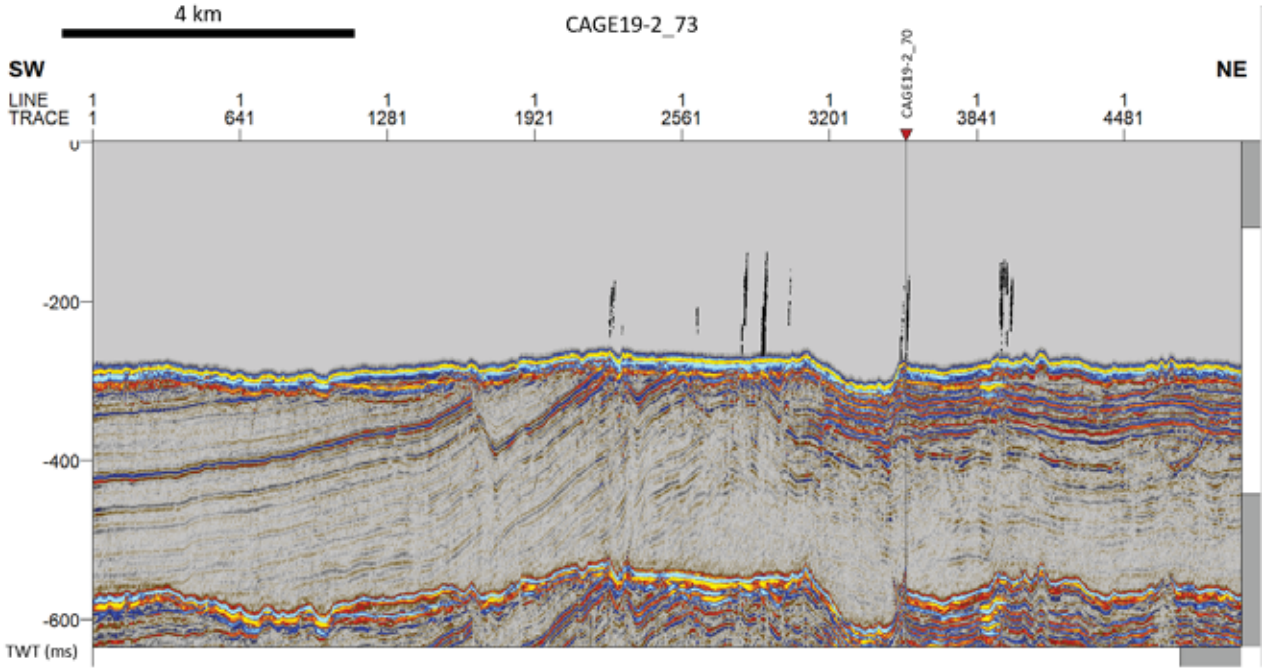


Figure 20. Seismic line 73 in area C on Kong Karls Land Platform with gas flares superimposed.

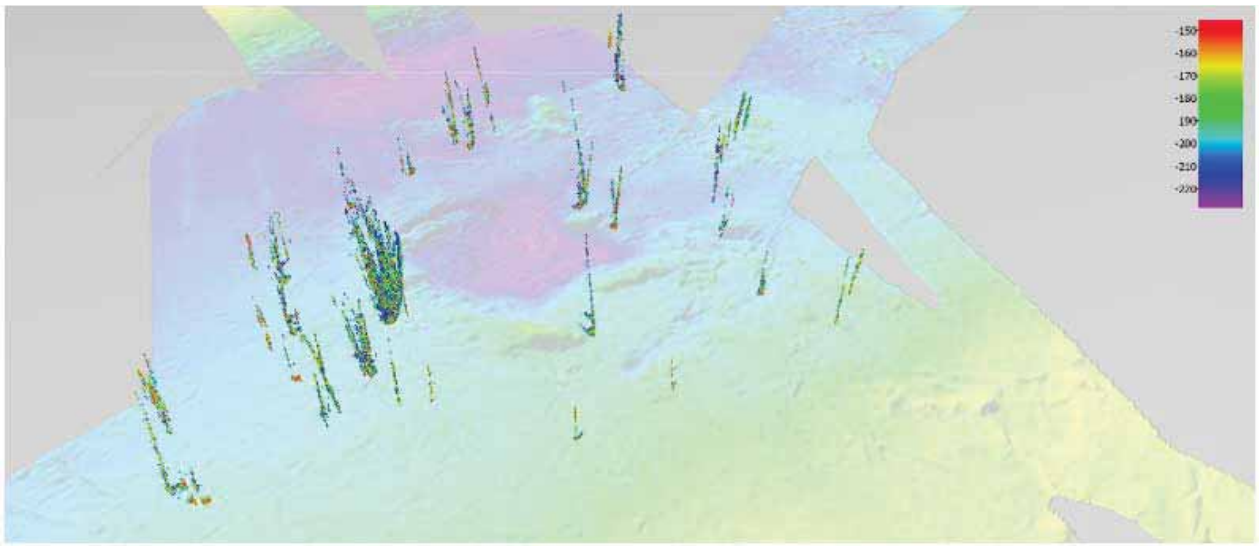


Figure 21. Fledermaus 3D view of gas flares superimposed on sea floor multibeam in area C on Kong Karls Land Platform, see Fig 19 for location.

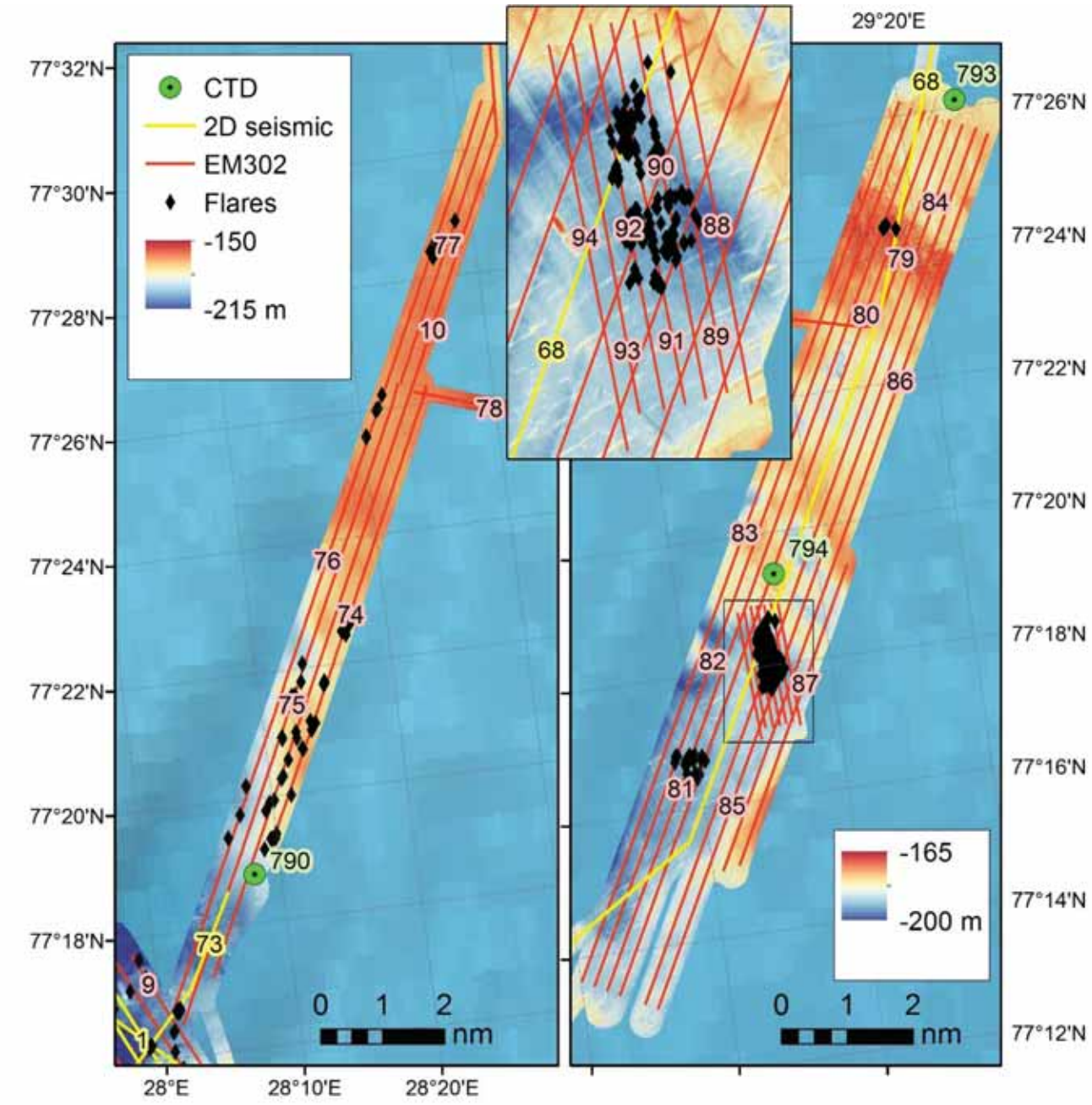


Figure 22. Multibeam, chirp-, seismic lines and CTD stations in study areas D and E on Kong Karls Land Platform as indicated in overview Fig. 17.

4.2. Storbanken study area (Area B in Fig. 23).

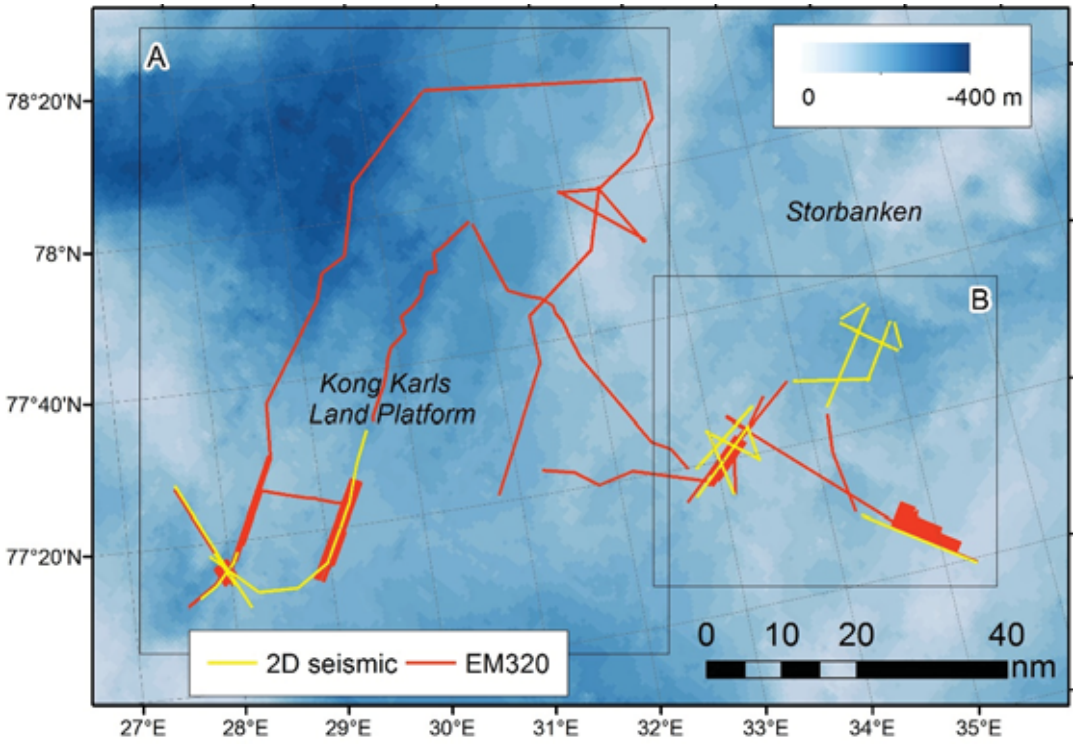


Figure 23. Data collected in the Storbanken area is indicated in B.

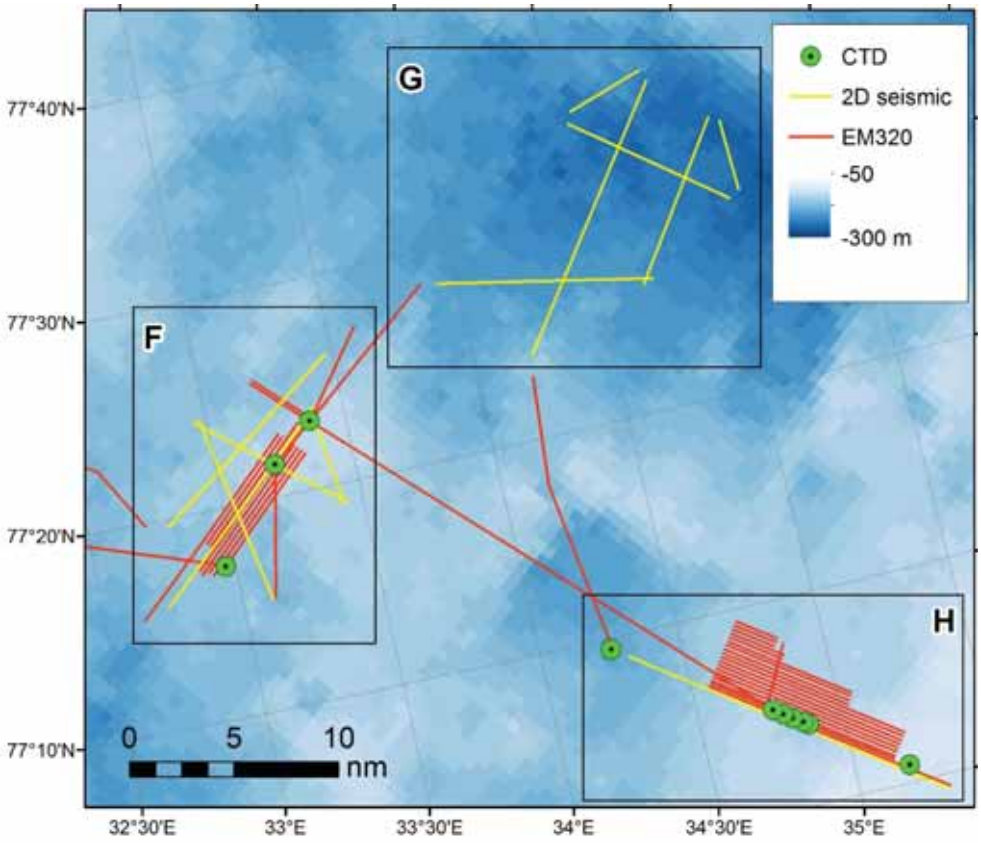


Figure 24. Overview of data acquired in the Storbanken area. Data acquired in areas F, G and H are indicated in Figs. 25-27.

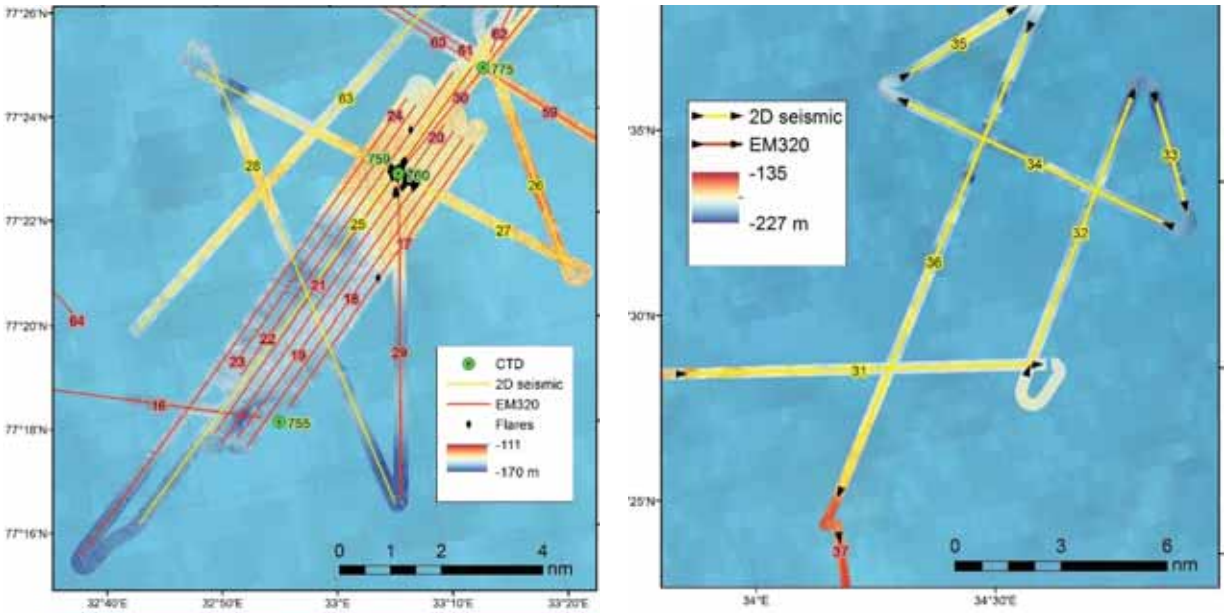


Figure 25. Multibeam, chirp-, seismic lines and CTD station in Storbanken areas F and G.

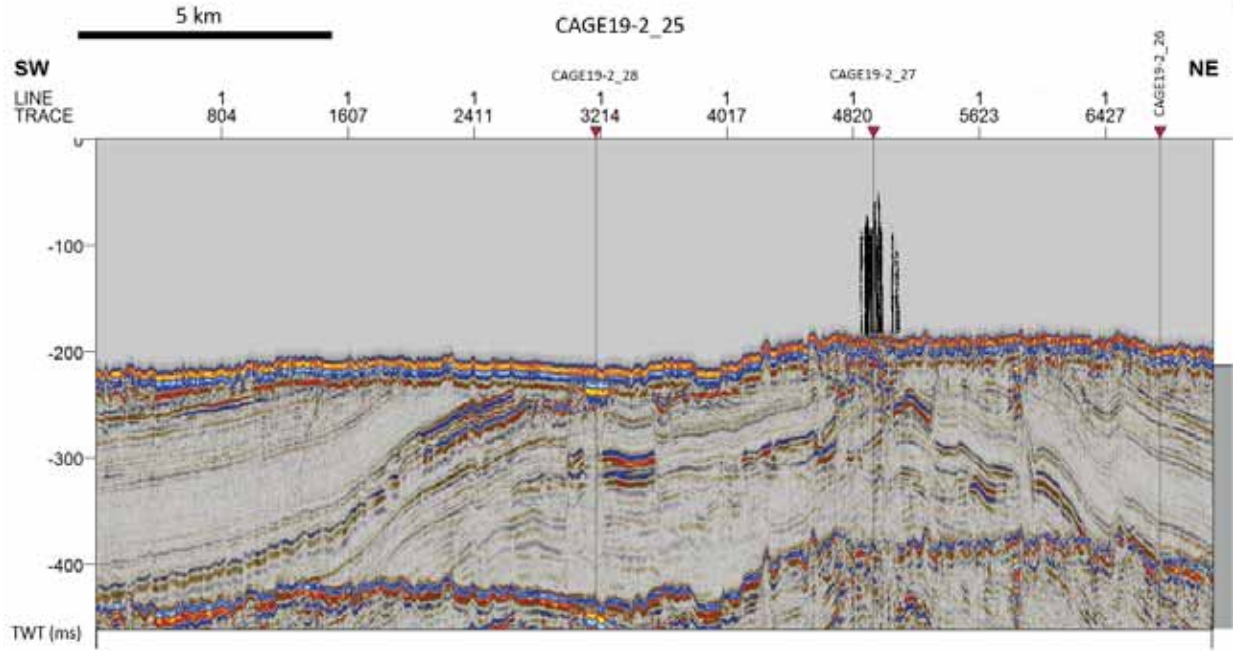


Figure 26. Seismic line 25 in area F of Storbanken with gas flares superimposed.

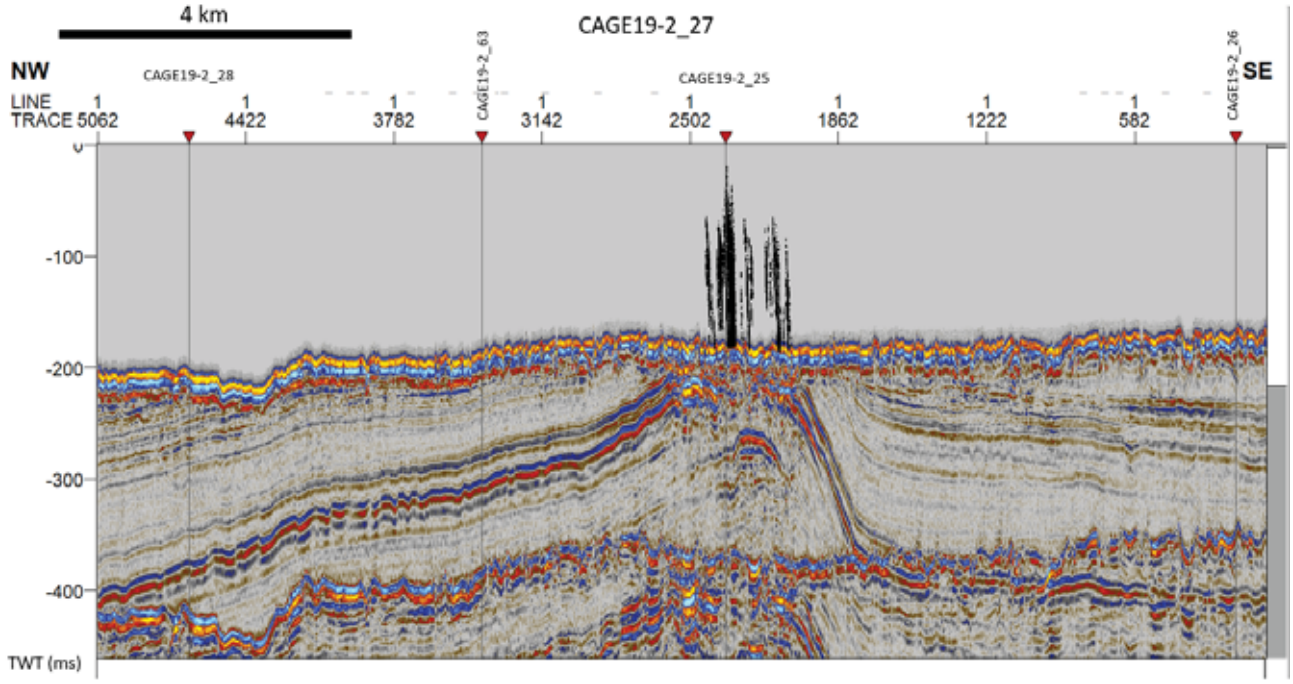


Figure 27. Seismic line 27 in area F of Storbanken with gas flares superimposed.

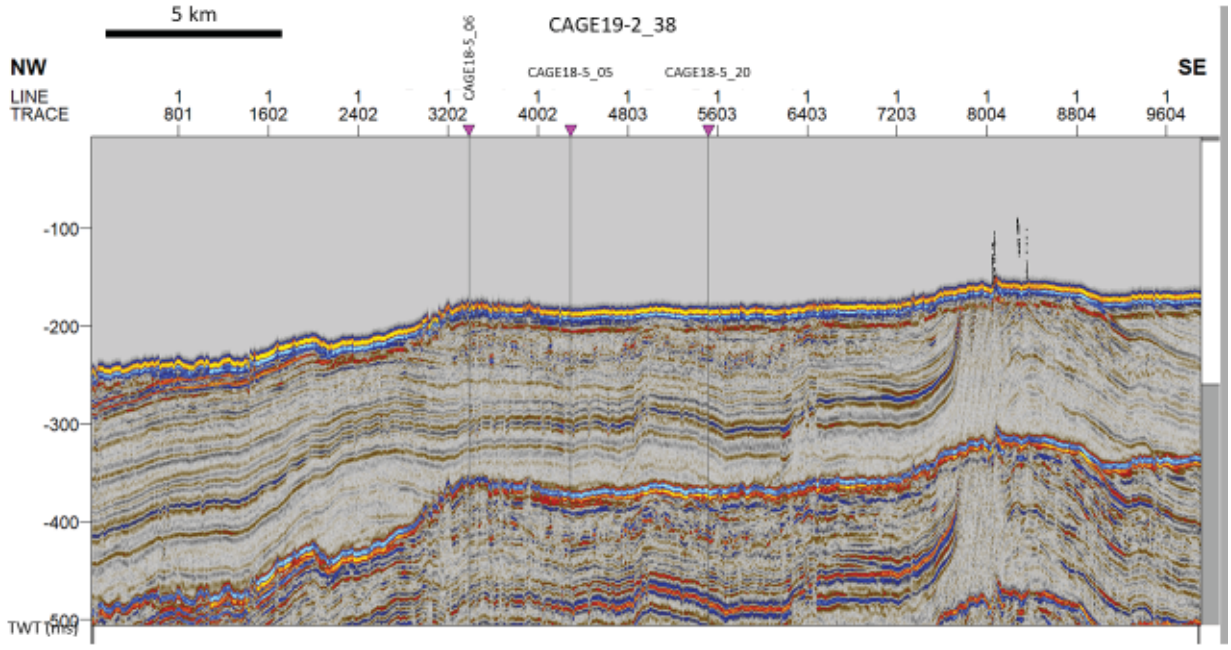


Figure 28. Interpreted seismic line 38 in area G of Storbanken with gas flares superimposed.

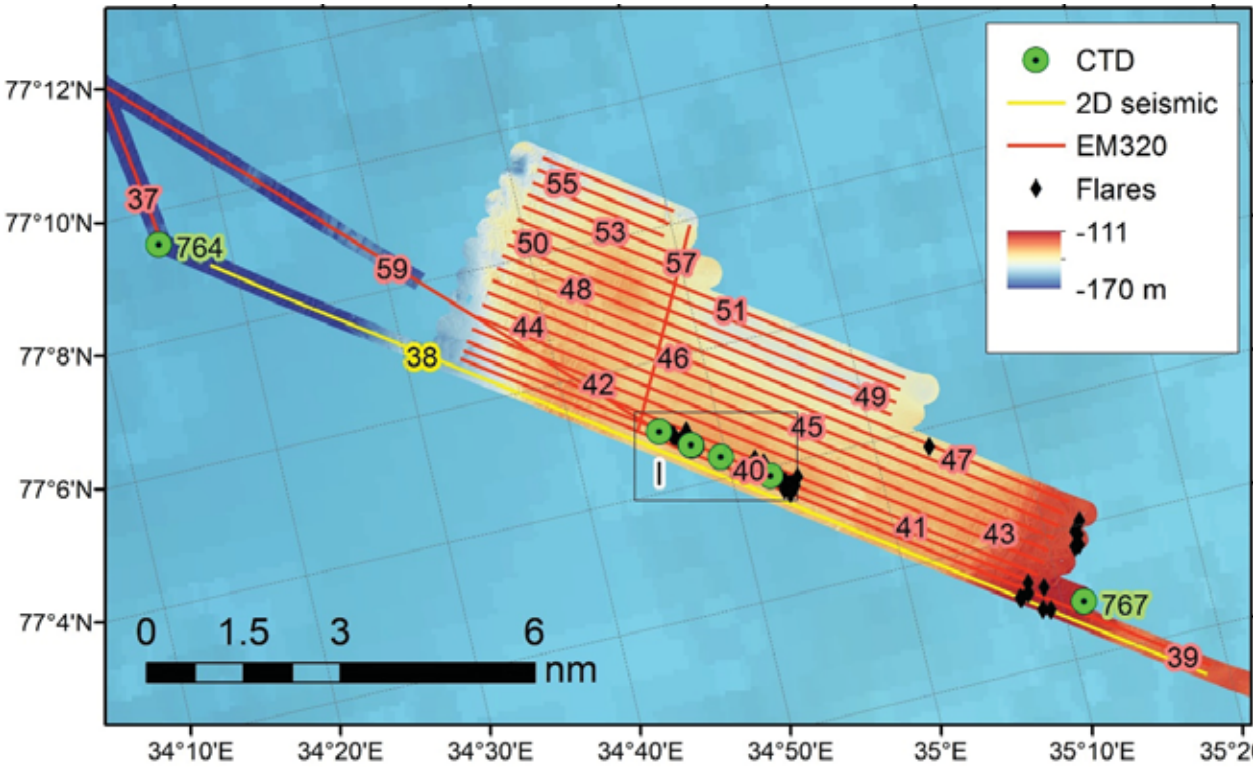


Figure 29. Multibeam, chirp-, seismic lines and CTD station in Storbanken area H. Zoom-in of box with single beam lines of area I is shown in Fig. 30.

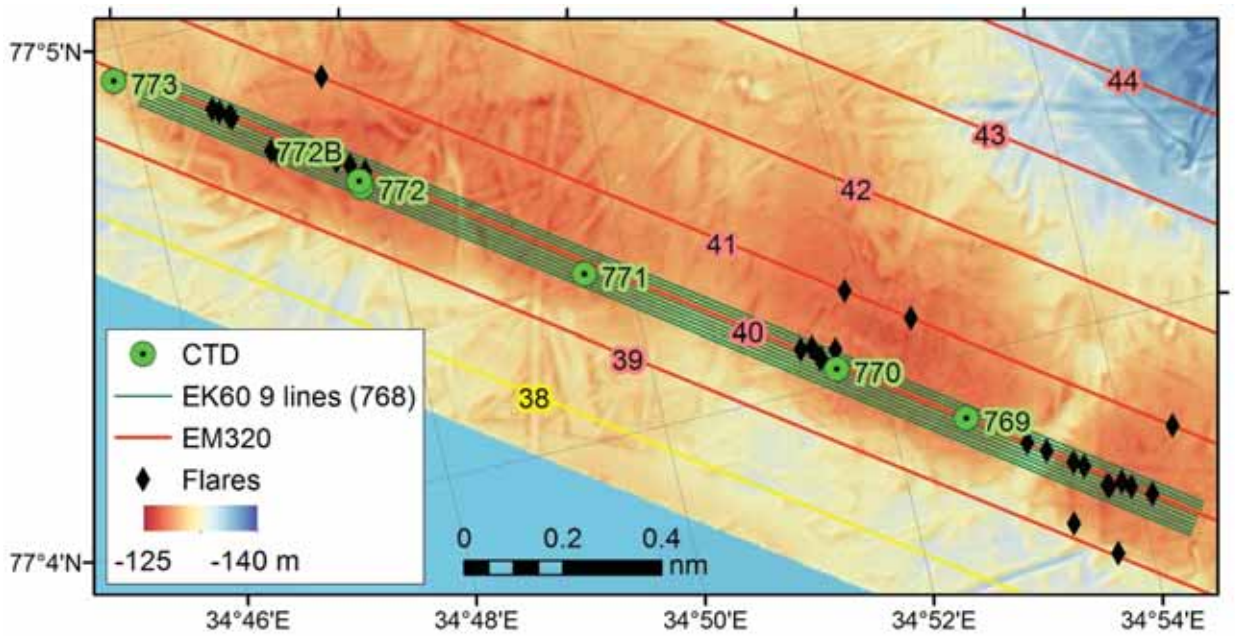


Figure 30. Box in area I of 9 single beam lines (Station 768) around line 40 and CTD stations 769-773 with water samples, to be used for numerical modelling of gas flux in the water. Location of the box is shown in Fig. 29.

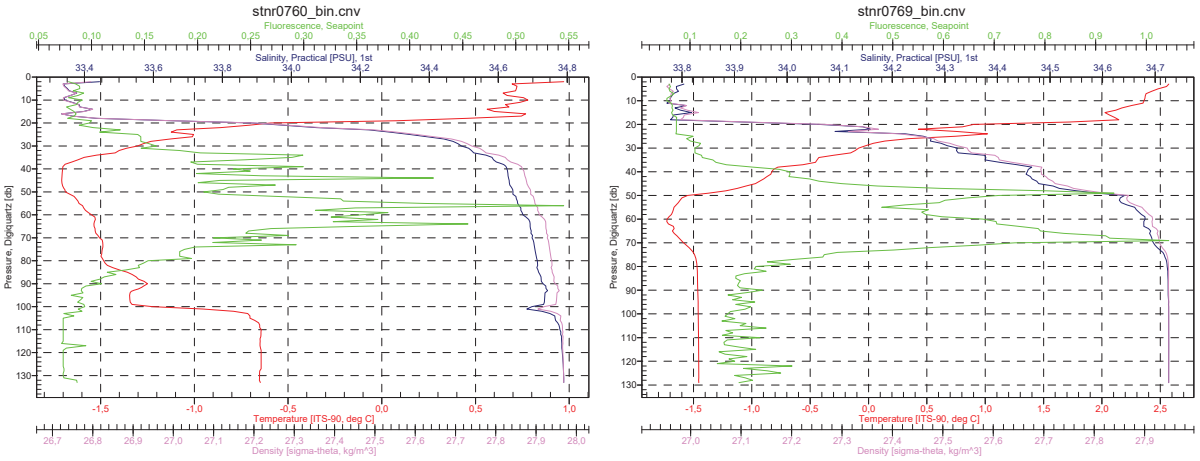


Figure 31. CTD stations 760 and 769 in Storbanken areas F and I.

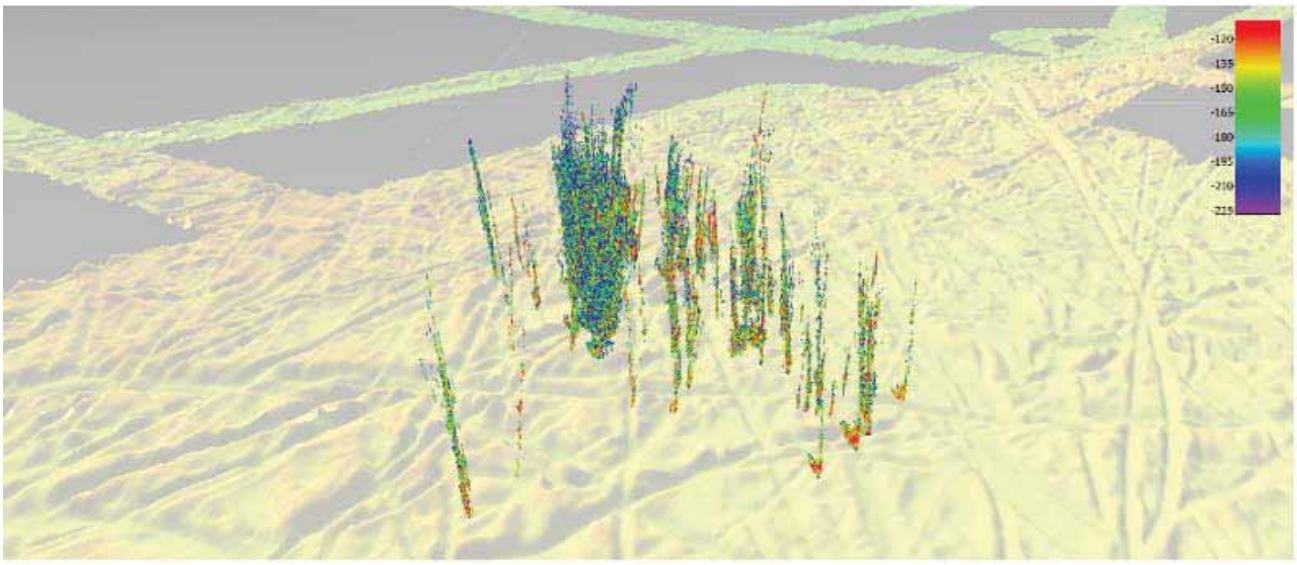


Figure 32. Multibeam superimposed by gas flares in the water in Storbanken area F; location shown in Figs. 24 and 25. The seafloor is heavily ploughed by icebergs, as for most of the Storbanken area.

4.1. Offshore Prins Karls Forland

The shallow (70 – 150 mbsl) shelf area west of PrinsKarls Forland (PKF), has been a focus study area for CAGE, since at least 2014. There is extensive methane seepage from the seafloor (Myhre et al., 2015) in the area, and we often observe bubbles streams that reach all the way to the sea surface. Three repeated (CAGE 14.1, CAGE 15.3, and CAGE 16.4) oceanographic (CTDs with water samples for analysis of gas concentration with GC) and acoustic water column surveys (EK60 single beam) has been performed (Silyakova et al., submitted) prior to the present cruise. The shelf surveys covered an area of 10 by 15 km and Landers have been deployed twice (CAGE 15.3 and CAGE 16.7), near the most intensive seepage.

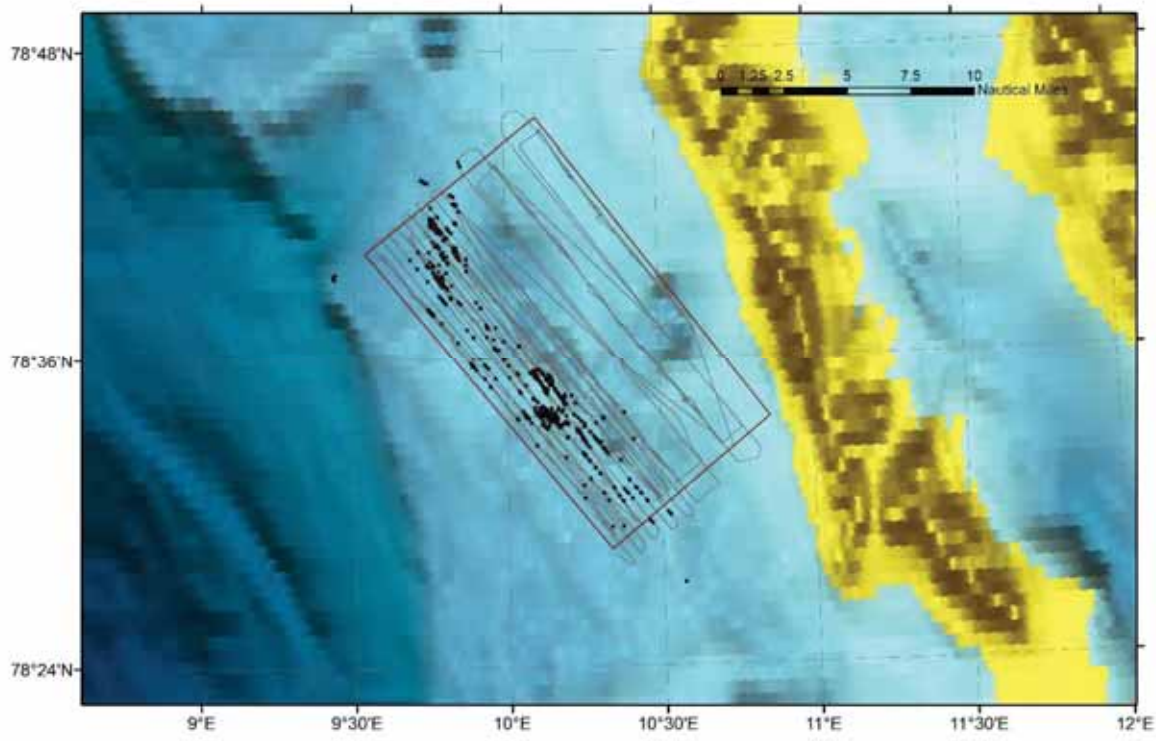


Figure 33 Study area west of Prins Karls Forland. Dots show known gas seepage locations from previous cruises, detected by single beam echosounder, lines show the ship tracks, and the rectangle indicates the extent of the 10 x 15 km box. The bathymetry is EBCO.

The part of the cruise, investigating this area had three objectives:

1. To deploy the CAGE/Kongsberg lander at the site where it has been previously deployed twice, to collect more methane seepage related data.
2. A small oceanographic survey (CTDs with water sampling) around the site of the lander, to improve our understanding of the origin of the gas, and its dynamics in the water column, after release from the seafloor.
3. To perform expanded and detailed investigations of water column acoustics to determine the current state of gas release into the water column and provide better bathymetry around the most intense seepage.

4.1.1 Lander deployment

The lander was deployed very close to where it was situated during 2016 – 2017 (See cruise reports CAGE 15-3 and CAGE 16-7). There was no lander deployment during the

period between summer 2017 and summer 2018. The Lander is a trawl- resistant pyramid type structure with instruments mounted inside a rigid frame (Figure 34). For this deployment, it was equipped with several sensors (Table 3), 20 batteries, a data processing unit (DPU), two power management units (PMUs), two under water communication modems (cNodes), and a releasable recovery buoy. For the deployment, a launcher system was rented from Kongsberg.

Table 3. List of instruments mounted on the lander and a short description of the parameters they are measuring. Serial numbers of the instruments are found in the appendix.

Instrument	***Parameter***
CTD	*Salinity, Temnperature, Pressure*
Oxygen sensor	*Dissolved oxygen*
Fluorometer	*Chlorophyll*
Transmissometer	*Turbidity*
Seaphox	*pH*
HydroC, CH4 meter	*Dissolved CH4*
HydroV, CO2 meter	*Dissolved CO2*
Flow meter	*Near field water flow field, electromagnetic*
Hydrophone	*Passive acoustic device listening for bubbles*
ADCP	*Current profiler, looking towards the surface*
M3	*Sidewards looking multibeam, detecting bubbles in front of the Lander.*

The structure of the Lander, a rolling frame, the telemetry system and the launcher system was shipped on Helmer Hanssen from Tromsø to Longyearbyen as temporary exports (proforma invoices and customs declarations in the appendix), with some sensors and all batteries mounted. The custom clearance was handled by Bring (Steinar Sørensen), and the Lander arrived in Longyearbyen on June 28th. It was placed in kind, in the hangar *rubhall* belonging to NP (Geir Ove Aspnes). Knut Ola Dølven (CAGE) and Oliver Kinski (Kongsberg) were in Longyearbyen to assemble the remaining instruments and to mount the launcher system. The Launcher system consists of a frame, two lithium batteries a camera arm, a wing, lights and cameras, a telemetry system and a releaser system. The system enables real time video feed from the launcher to the instrument room during deployment and control of camera and lights. The deployment is controlled via a winch with fiber optics. Upon deployment, the release of the Lander is triggered from the instrument room on Helmer Hanssen.

Figure 34. The K-Lander with Launcher system is lifted on board Helmer Hanssen using the HH Crane and onto the Geology deck.

The remaining instruments were transported by air to Longyearbyen and mounted on the Lander, with the exception of a CTD, a flow meter and some cables that were missing from the instrument delivery. Pär Jansson, Manuel Moser, Truls Holm and Steinar Iversen mounted the last (previously missing) instruments on July 20th. Transport of the Lander/ Launcher, the fiber optics winch and cable, a sand anchor, and box with remaining spares etc., was arranged with LNS Spitsbergen (Guro Fatsvold) and was carried out at 17:00. The equipment was lifted on board and all systems were connected and tested during the evening and night of the 20th. Transit to Prins Karls Forland begun on the 20th around 20:00. We performed acoustic and oceanographic surveys before the deployment (see below), and bad weather (waves higher than 1.8 meters) stopped us from deploying immediately after. It was decided to wait with the deployment until July 22nd at 14:00.

After a short toolbox meeting with the Captain, Crew, Karin, Manuel, Pär, Steinar and Truls, the deployment procedure started. Figure 35 shows the lander/Launcher being lifted off the Geology deck with the main crane and into the water. The fiber optics wire and winch lowered the instruments to ~5 m above the seafloor. Prior, the ship had anchored and was maneuvered into position by bow thrusters and the anchor winch, which improved its ability to move slowly and accurately. The lander cable length was controlled via a cabled remote control from the instrument room, where also a video feed from the Launcher camera was displayed on a screen. The Kongsberg software, communicating with the launcher through the same cable, enabled control of lights, camera, and the remote releaser. After ~2.5 hours of hovering above the seafloor, bubbles were clearly visible on the screen, and it was decided to release the Lander. Figure 36 shows the acoustic lines and the Lander deployment site. The final position of the ship when the lander was released was:

78° 33.787 N – 10° 8.119 E

And is visualized in figure 37.

The communications devices (Cnodes) mounted on the lander were 14083 (autonomous battery powered, with channel M27 or B83), and 14081 (powered by lander batteries, with channel M25 or B81). This information is used by the Cpap computer/ underwater acoustic modem, for the future recovery of the lander. Directly after the deployment we performed a successful communications test. The batteries of the lander were stipulated to last for 11 months.

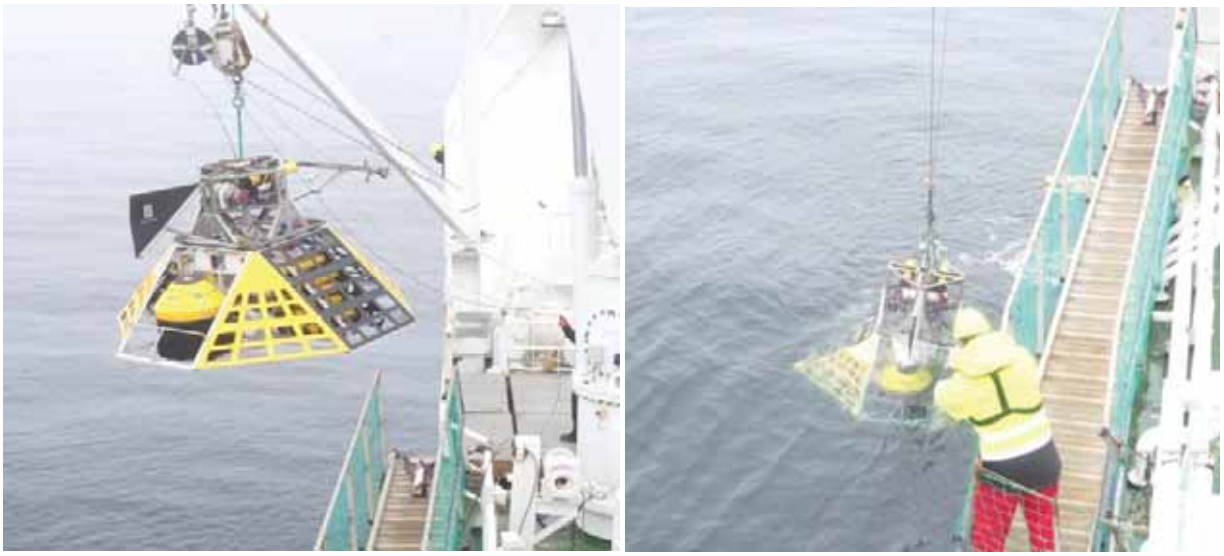


Figure 35. Left: Lander and launcher being lifted off the Geology deck with the main crane. Right: Lander and launcher touching the water.

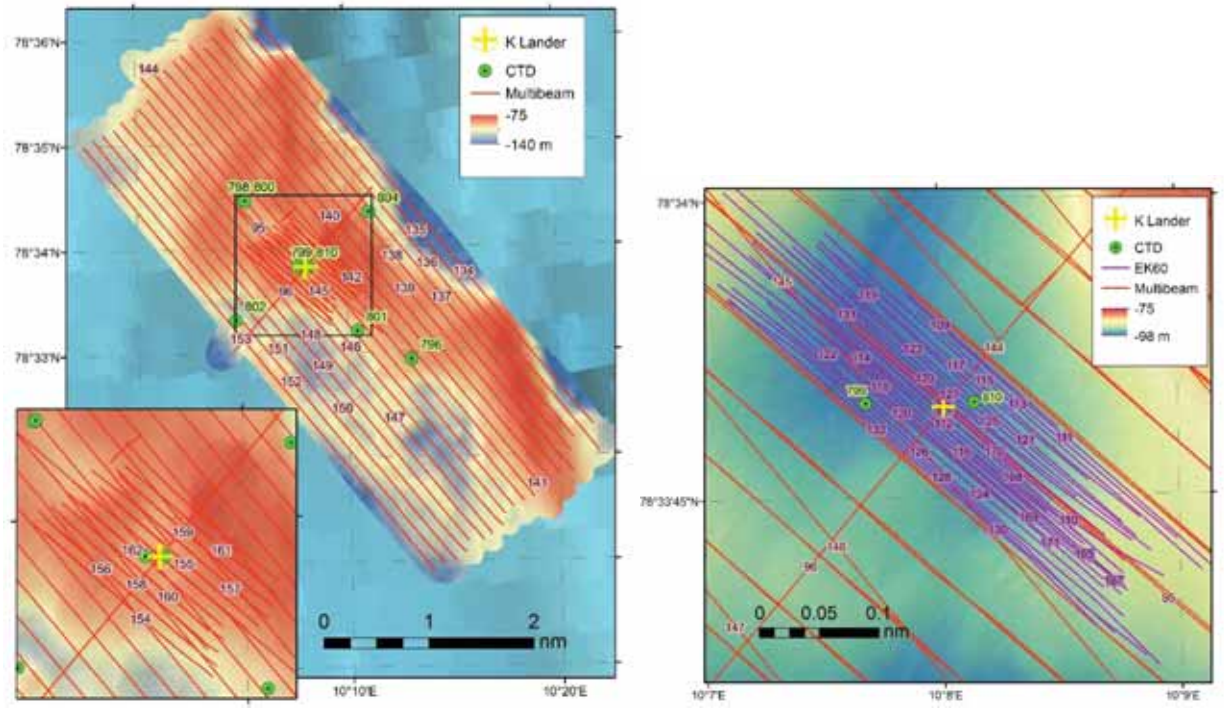


Figure 36. Maps showing the location of the planned lander location, the CTD locations and the multi- and single beam echosounder transects.

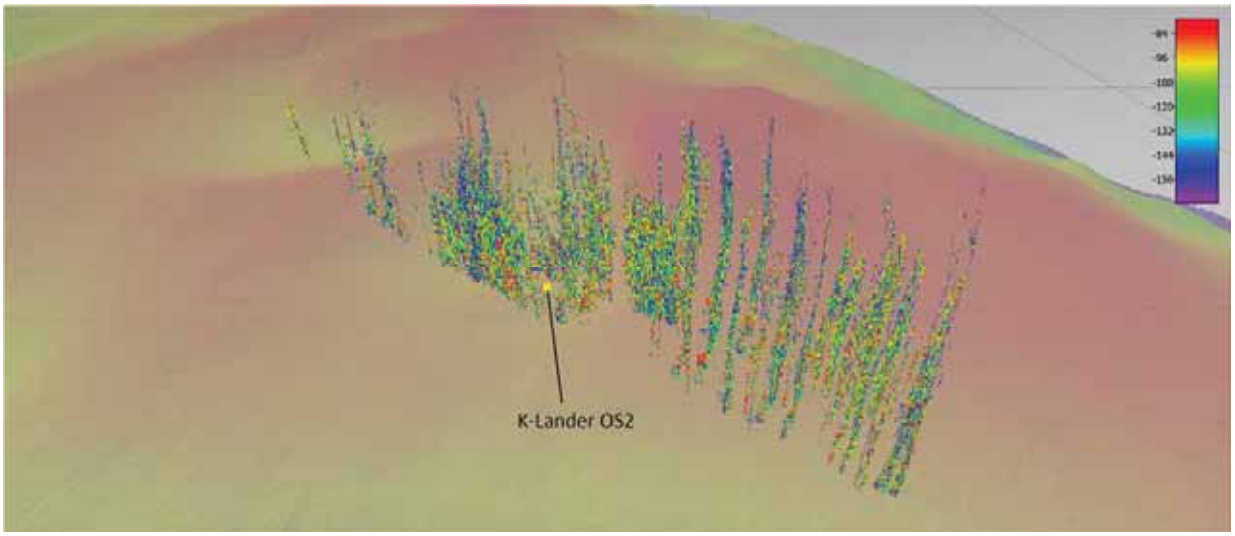


Figure 37. 3D image showing the location of the lander, together with some of the bubble streams (flares) that were observed with the multibeam echosounder.

4.1.2 Oceanographic survey

A small grid of 5 CTD stations (stnr 789, 799, 801, 802, 804) were performed prior to the Lander deployment (positions of the CTDs in figure 36). Water samples were taken at 12 different depths at each station and Niskin bottles were subsampled for the parameters seen in table 4. An additional CTD cast with the same sampling strategy was performed immediately after the multibeam survey (stnr 810).

Table 4. Sampling strategy for each CTD station with water samples.

Bottle NO	Close Bottles at: Depth	DIC	$\delta^{13}C$-DIC	CH_4 conc.	$\delta^{13}C$-CH_4	$\delta^{2}H$-CH_4	Nutrients	Alkalinity	$\delta^{18}O$-H_2O
1	85	X	X	X	X	X	X	X	X
2	80	X	X	X	X	X	X	X	
3	75	X	X	X			X	X	
4	65	X	X	X			X	X	
5	58	X	X	X	X	X	X	X	X
6	50	X	X	X			X	X	
7	42	X	X	X			X	X	
8	34	X	X	X			X	X	X
9	25	X	X	X			X	X	
10	20	X	X	X			X	X	
11	15	X	X	X			X	X	
12	5	X	X	X			X	X	X

Instructions for the subsampling of water samples from the Niskin bottles were the following:

CH_4 concentration

Water from Niskin bottles is transferred into 120 mL vials. Overflow bottles 3 times and avoid bubbles. Add 1 mL 1 M NaOH. Seal vials with rubber septa and aluminum crimp caps. Create 5 ml headspace by replacing sample water with N2 gas using a hose/needle connected to a gas bottle (and T-connection to water bottle/atmosphere), and

withdrawing 5mL water using a syringe. Samples must be equilibrated > 24h at fixed/known temperature before analysis.

$\delta^{13}C$ of CH_4 in water
Use the same sampling procedure as for Concentration, but do not add headspace. Store samples cold.

δD of CH_4 in water
Use the same sampling procedure as for Concentration, but do not add headspace. Store samples cold.

δD and $\delta^{18}O$ of H_2O
Use 20 ml screw cap glass vials. Rinse container thoroughly. Fill completely. Store samples cold.

$\delta^{13}C$ of DIC and DIC concentration
Sample water in 4.5 ml vials with screw cap. Rinse thoroughly, fill to the top and close with crew cap. Under the fume hood, wearing safety clothing and gloves, add 10 uL of concentrated HgCl2(aq) to stop microbial activity. Mark the samples ***Hg-contaminated***. Keep Hg contaminated waste separate from other waste and leave it in the fume hood. Minimize this waste. Store the samples cold – do not freeze.

Nutrients (Nitrate, phosphate, silicate)
Use 60 ml plastic bottles and rinse several times. Fill to 90% of the total volume and close with clean screw cap. Store in freezer (-20°C). No other preservation is needed.

Alkalinity
Use 60 ml plastic bottles and rinse several times. Fill to the top and close with rinsed screw cap. Store cold (4°C).

All water samples will be brought to Tromsø for later analysis.
The CTD continuous profiles and actual bottle firing depths are seen in figure 38. Salinity was homogenous at ~35 PSU, while the temperature profile was well mixed only in the top 20 m. Below that, continuous thermal stratification was present in all casts.

4.1.3 Water column acoustics
Prior to the lander deployment, we performed a multibeam survey, 1 x 1 km consisting of 11 lines (100 m spacing), and a detailed singlebeam survey 300 x 200 m, with 25 lines (line spacing 8 m) as seen in figure 36.
Directly after, a CTD survey was performed (see sec. 4.1.2), and while waiting for good deployment conditions, a larger multibeam survey was carried out, consisting of 20 multibeam lines á 9.5 km (spacing 200 m). After the deployment, we repeated the multibeam 1 x 1 km grid and started repeating the single beam grid. Due to time constrains we could not finish the second singlebeam grid. Ship tracks from these acoustic survey lines are seen in figure, Lines perfromed are seen in figure 36, and a 3D visualization of a selection of data is shown in figure 37.

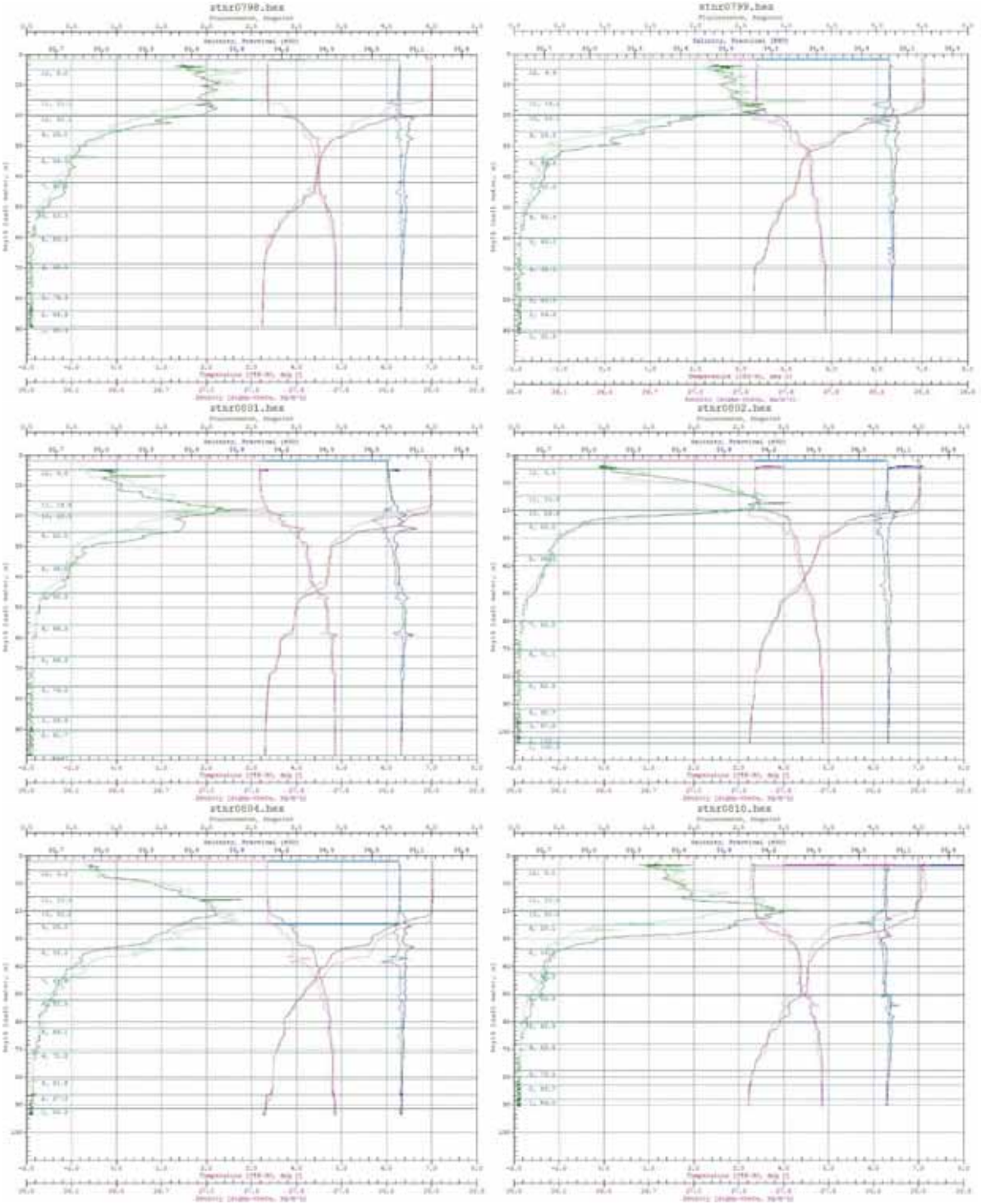


Figure 38. Vertical profiles from the 5 CTD casts prior to the lander deployment and one cast, performed after.

5. Logs

Event log CAGE 19-2

Date	Time (UTC)	Event
09-07-19	1800	Departed Longyearbyen, heading to Kong Karls Land Platform. The lander was left in Longyearbyen waiting for delivery of cables that had been delayed in Tromsø. Last box expected to arrive in LYR 12th July.
10-07-19		Engineers working on 15/15 MiniGI airgun to check what didn't function well on the last 19-1 cruise. Discovered crack in one shuttles, so the airgun cannot be used. Will start using 30/30 miniGI in KKL Platform.
10-07-19	1003	Started CHIRP during transit. Filenames (sequential): transit-1
11-07-19	04:23	CTD stnr738 , to correct sound velocity for the echosounders and MB at end of transitline
11-07-19	07:58	Started seismic line 0001 and MB+chirp 0001, stnr740, surveying over crater structure on KKPL
11-07-19	12:30	Ended seismic line 0001 and chirp 0001-stnr740, started MB+chirp 002-010, stnr-742-746
11-07-19	12:58	CTD stnr741, to correct sound velocity for the echosounders and MB
11-07-19	15:10	Started seismic line 002, stnr-743
11-07-19	16:27	Ended seismic line 002, stnr-743
11-07-19	16:47	CTD stnr744, to correct sound velocity for the echosounders and MB
11-07-19	20:15	Started MB/Chirp survey north along main line 010.
11-07-19	23:21	CTD stnr747, to correct sound velocity for the echosounders and MB
11-07-19	23:37	Started MB+chirp 010b, stnr 748
12-7-19	00:30	Met sea-ice – had to reduce speed through multibeam survey.
12-07-19	3:53	CTD stnr749, to correct sound velocity for the echosounders and MB
12-07-19	08:55	Started MB+chirp line 011, stnr 750. (west-east transit line)
12-07-19	11:47	CTD stnr751, to correct sound velocity for the echosounders and MB
12-07-19	12:06	Started MB+chirp 012-016, stnr 752. Long MB lines over KKLP – Storbanken. CTD stations 753 performed between lines 13 and 14,and station 754 during line 16 (polar bear spot), and 755 after line 16.
13-07-19	05:19	Start MB surveying lines 17-28 at central Storbanken area:stnr 756,757
13-7-19	14:09	Start 2d seismic survey over central Storbanken area: stnr757-758, lines 25-28.
13-07-19	23:25	Two CTDs (stnr 759-760), to correct sound velocity for the echosounders and MB, and collect water samples over large flare.
14-07-19	00:29	Start of the transit line 29 to the next seismic area over north Storbanken (Stnr 761).
14-07-19	2:24	Start of the seismic survey over 31entral Storbanken area. Lines 31 to36. (Stnr 762)
14-07-19	15:25	Start of the transit to the next area (stnr 763)
14-07-19	16:55	CTD stnr764, to correct sound velocity for the echosounders and MB
14-07-19	17:32	Start of the seismic line 38.stnr764

14-07-19	21:14	Airgun taken out, end of seismic in the area, stnr-765
14-07-19	21:28	After finishing seismic, MB+chirp started again, stnr-766
15-07-19	00:32	CTD stnr767, to correct sound velocity for the echosounders and MB
15-07-19	00:46	MB + Chirp started again. Stnr – 768
15-07-19	02:05	MB + Chirp started. Stnr – 768
15-07-19	3:23	MB + Chirp started. Stnr – 768
15-07-19	4:41	MB + Chirp started. Stnr – 768
15-07-19	22:33	CTD transect across EK60 survey area, collecting water samples. CTD stnr769, to collect water samples.
15-07-19	23:13	CTD stnr770, to collect water samples.
15-07-19	23:47	CTD stnr771, to collect water samples.
16-07-19	00:20	CTD stnr772, to collect water samples. CTD stnr772 two bottles did not fire so CTD was redone (772B). Stnr 773 one bottle (bottle 11) did not fire.
16-07-19	00:39	CTD stnr(772B) started.
16-07-19	01:07	CTD stnr(773) started.
16-07-19	02:19	Stnr 774, MB + Chirp for the transit line.
16-07-19	04:11	Stnr 775 CTD was done for the calibration of the multibeam.
16-07-19	04:22	MB+Chirp started. Two short multibeam survey lines over central Storbanken survey area (Stnr 776), lines 60-61.
16-07-19	06:48	Start of the seismic line stnr 777.
16-07-19	09:52	MB + Chirp. Stnr 778
16-07-19	15:31	Stnr – 779. CTD for sound velocity profile of the multibeam.
16-07-19	15:54	Started MB + Chirp line surveys on transit to, and over a large anticline structure on KKLP. Stnr – 780. Met dispersed sea ice around 18:30.
16-07-19	22:16	Stnr-781. Seismic survey in KKLP, south of anticline towards depression area
17-07-19	07:50	Gravity coring. Stnr-782
17-07-19	09:05	MB+Chirp started (0071). Stnr-783
17-07-19	09:40	Gravity coring. Stnr-784
17-07-19	10:41	Multi coring. Stnr-785
17-07-19	12:46	Multi coring. Stnr-786
17-07-19	13:10	MB+Chirp started (0072). Stnr-787
17-07-19	13:54	CTD. Stnr-788

17-07-19	14:44	Seismic survey started (0073). Stnr - 789
17-07-19	16:54	Seismic survey ended (0073)
17-07-19	17:11	CTD. Stnr-790
17-07-19	17:26	MB+Chirp started (0074-0078). Stnr-791
18-07-19	00:02	MB+Chirp continued (0079-0087).Stnr-792
18-07-19	00:24	CTD. Stnr-793
18-07-19	14:43	CTD. Stnr-794
18-07-19	15:16	MB survey started with no chirp. Stnr-795
18-07-19	18:35	MB ended. Heading back to Longyearbyen.
20-07-19	07:00	Arrival in Longyearbyen. Mounting cables for Lander on land and testing fiber connections…..
20-07-19	21:00	Leaving Longyearbyen at slow speed while testing Lander connections
20-07-19	22:30	Leaving for location offshore of PKF at 10 kn
21-07-19	05:12	Arrive at Prins Karls Forland. CTD stnr0796,no water, for correcting SVP for multibeam
21-07-19	05:29	Multibeam survey start, MB line 0096, Prosject CAGE_19_2_EM302_PKF. Stnr797.
21-07-19	06:15	Begin CTD survey with water samples around multibeam grid, stations 798-802. First station was repeated (800).
21-07-19	09:20	MB survey started. Stnr 803
21-07-19	10:05	Begin CTD survey with water samples. Stnr 804
21-07-19	10:35	Start of the grid multibeam survey. Stnr 805.
21-07-19	13:06	MB survey continued. Stnr 805B
21-07-19	15:13	End of the grid multibeam survey. Stnr 805B
21-07-19	15:23	Start of the grid singlebeam survey (EK60 survey). Stnr 806
21-07-19	20:36	End of the grid singlebeam survey.
21-07-19	21:15	Stnr – 807 MB Survey Start
22-07-19	12:10	Started deploying Lander Stnr 808
22-07-19	14:33	Lander released Stnr 808
22-07-19	15:20	Start of MB survey Stnr 809
22-07-19	18:39	Begin CTD survey. Stnr 810
22-07-19	19:15	Begin SB (EK60) survey. Stnr-811
22-07-19	20:58	Survey finished. The end

Core Log CAGE 19-2

Ship Station	Station Id	Date (UTC)	ime (UTC	Latitude	North/ South	Longitude	East/ West	Equipment	Recovery	Water Depth	Notes	Sub Samples
782	CAGE19-2-HH-782-GC	17.07.2019	07:50	77 16.850	N	27 56.202	E	Gravity corer	233	211.48	no flare observed in echosounder EK60	3
784	CAGE19-2-HH-784-GC	17.07.2019	09:40	77 15.6905	N	27 55.7554	E	Gravity corer	48	197.86	c1 flare observed	1
785	CAGE19-2-HH-785-MC	17.07.2019	10:41	77 15.6906	N	27 55.7840	E	Multi corer	4 cores	197.27	4 out of 6 cores successful. Even worms were found.	cores lengths subsections: 56, 52, 52 and 50 cm.
786	CAGE19-2-HH-786-MC	17.07.2019	12:46	77 16.246	N	27 59.009	E	Multi corer	2 cores	221	c1 flare observed, 2 out of 6 cores successful	core lengths : 38 and 42 cm.

CTD log CAGE 19-2

Site/Area	Ship Station	Station Id	Date (UTC)	Time (UTC)	Latitude	North/South	Longitude	East/West	Water Depth	Bottles fired	Notes
Kong Karls Land Platform	738	CAGE19-2-HH-738-CTD	11.07.2019	04.54.39	77 6.6868	N	28 18.1474	E	191	0	to correct sound velocity for the echosounders and MB
Kong Karls Land Platform	741	CAGE19-2-HH-741-CTD	11.07.2019	12.54.35	77 28.4864	N	27 30.4268	E	165	0	to correct sound velocity for the echosounders and MB
Kong Karls Land Platform	744	CAGE19-2-HH-744-CTD	11.07.2019	16.45.50	77 13.6156	N	28 03.3772	E	169	0	to correct sound velocity for the echosounders and MB
Kong Karls Land Platform	747	CAGE19-2-HH-747-CTD	11.07.2019	23.20.41	77 38.0084	N	28 36.4373	E	192	0	to correct sound velocity for the echosounders and MB
Kong Karls Land Platform	749	CAGE19-2-HH-749-CTD	12.07.2019	03.51.20	77 51.1967	N	29 16.1283	E	287	0	to correct sound velocity for the echosounders and MB
Kong Karls Land Platform	751	CAGE19-2-HH-751-CTD	12.07.2019	11:46:57	78 11.66190	N	33 03.182	E	156	0	to correct sound velocity for the echosounders and MB
Kong Karls Land Platform	753	CAGE19-2-HH-753-CTD	12.07.2019	16:51:51	77 50.280	N	32 46.141	E	164	0	to correct sound velocity for the echosounders and MB
Kong Karls Land Platform	754	CAGE19-2-HH-754-CTD	13.07.2019	01:11:00	77 22.076	N	31 03.872	E	184	0	to correct sound velocity for the echosounders and MB
Kong Karls Land Platform	755	CAGE19-2-HH-755-CTD	13.07.2019	01:11:00	77 22.076	N	31 03.872	E	184	0	to correct sound velocity for the echosounders and MB
Kong Karls Land Platform	759	CAGE19-2-HH-759-CTD	13.07.2019	23:24:33	77 21.5631	N	33 12.9095	E	136	12	Sampling over large flare
Storbanken	760	CAGE19-2-HH-760-CTD	14.07.2019	00:00:48	77 21.5544	N	33 12.904	E	136	12	Sampling over large flare
Storbanken	764	CAGE19-2-HH-764-CTD	14.07.2019	16:55:33	77 09.4982	N	34 15.2511	E	171.96	0	to correct sound velocity for the echosounders and MB
Storbanken	767	CAGE19-2-HH-767-CTD	15.07.2019	00:31:24	77 00.851941	N	35 11.487029	E	115.54	0	to correct sound velocity for the echosounders and MB
Storbanken	769	CAGE19-2-HH-769-CTD	15.07.2019	22:33:46	77 03.872358	N	34 52.648606	E	129.42	12	CTD transect over EK60 area
Storbanken	770	CAGE19-2-HH-770-CTD	15.07.2019	23:13:13	77 04.03111	N	34 51.623911	E	130	12	CTD transect over EK60 area
Storbanken	771	CAGE19-2-HH-771-CTD	15.07.2019	23:47:31	77 04.334741	N	34 49.618554	E	130	12	CTD transect over EK60 area
Storbanken	772	CAGE19-2-HH-772-CTD	16.07.2019	00:20:24	77 04.60964	N	34 47.845951	E	129.35	10	CTD transect over EK60 area
Storbanken	772B	CAGE19-2-HH-772B-CTD	16.07.2019	00:39:13	77 04.622189	N	34 47.841778	E	129.33	12	CTD transect over EK60 area
Storbanken	773	CAGE19-2-HH-773-CTD	16.07.2019	01:07:42	77 04.933252	N	34 45.903791	E	131.48	11	CTD transect over EK60 area
Storbanken	775	CAGE19-2-HH-775-CTD	16.07.2019	04:06:21	77 23.244222	N	33 22.304614	E	134.86	0	to correct sound velocity for the echosounders and MB
Storbanken	779	CAGE19-2-HH-779-CTD	16.07.2019	15:31:41	77 57.156285	N	30 58.049452	E	238.84	0	to correct sound velocity for the echosounders and MB
Storbanken	788	CAGE19-2-HH-788-CTD	17.07.2019	13:54:55	77 11.71307	N	27 32.852546	E	217.21	0	
Storbanken	790	CAGE19-2-HH-790-CTD	17.07.2019	17:11:38	77 18.799472	N	28 08.073575	E	194.59	0	
Storbanken	793	CAGE19-2-HH-793-CTD	18.07.2019	00:24:46	77 26.133646	N	29 23.935893	E	181.18	0	
Storbanken	794	CAGE19-2-HH-794-CTD	18.07.2019	14:43:03	77 19.382538	N	29 06.937435	E	179.56	0	
Prins Karls Forland	796	CAGE19-2-HH-796-CTD	21.07.2019	05:12:05	78 32.9327	N	10 13.0285	E	96.09	0	to correct sound velocity for the echosounders and MB
Prins Karls Forland	798	CAGE19-2-HH-798-CTD	21.07.2019	06:15:34	78 34.457	N	10 05.142	E	93.19	12	CTD survey over multibeam area. 1 bottle did not close.
Prins Karls Forland	799	CAGE19-2-HH-799-CTD	21.07.2019	06:39:50	78 33.444	N	10 07.683	E	94.61	12	CTD survey over multibeam area. Location 2
Prins Karls Forland	800	CAGE19-2-HH-800-CTD	21.07.2019	07:22:34	78 34.464	N	10 5.193	E	93.04	12	Repeat of station 799 as 1 bottle did not close. Location
Prins Karls Forland	801	CAGE19-2-HH-801-CTD	21.07.2019	08:03:15	78 33.207	N	10 10.470	E	102.73	12	CTD survey over multibeam area. Location 3
Prins Karls Forland	802	CAGE19-2-HH-802-CTD	21.07.2019	08:59:21	78 33.325	N	10 04.670	E	105.86	12	CTD survey over multibeam area. Location 4
Prins Karls Forland	804	CAGE19-2-HH-804-CTD	21.07.2019	10:05	78 34.340496	N	10 11.108349	E	100.29	12	
Prins Karls Forland	810	CAGE19-2-HH-810-CTD	22.07.2019	18:39	78 33.806602	N	10 08.125747	E	93.69		

CAGE 19-2 Linelog

Site/Area	Activity	Line Id	Date (UTC)	Time (UTC)	Start Shot	Latitude	N/S	Longitude	E/W	End Time (UTC)	End Shot	Latitude (end)	N/S (end)	Longitude (end)	E/W	Equipment	Pulse Mode	Shot interval (s)	Speed (kn)	Notes
Sørkapp-KKLP		Transit1	09.07.2002				N		E	04:23		77 06.697	N	028 17.899	E	MB + chirp	2-8kHz,40ms	1	~10	Transit to KKLP (MBxxx-0073)
Kong Karls Land Platform		CAGE19-2-HH-0001-2D	11.07.2019	07:58	1195	77 10.305	N	28 12.062	E	12:30	4447	77 28.09	N	27 32.857	E	2D				Midcentre point of line modified to intersect crater (UTM projection does not create straight enough lines over long distances). Using 1 Mini GI 30/30. Record length 2 sec. Sample interval 0.25 ms. Speed 4.5 knots. Channel 23 is weak. Channel 8 is low. Cnannel 9 is noist Shot rate 5 sec. 1 Airgun shooting. Lines start with number 0001. Shot 2027 Cnannels 1-16 noisy. 2721 Channels 1-16, 2723, 2727 2730, 2731, 2737, 2738, 2746, 2759 Most channels from 1 till 16 noisy
KKLP		CAGE19-2-HH-001-chirp	11.07.2019	07:58	1195	77 10.305	N	28 12.062	E	12:30		77 28.09	N	27 32.857	E	MB + chirp	2-8kHz,40ms			Line Multibeam MB082-091. 10:56, 3325 Turn off chirp to figure out the problem with unexpected bright reflection (100 ms from seafloor). 11:02,3404 Chirp turn on.
KKLP		CAGE19-2-HH-0002-2D	11.07.2019	15:10	4448	77 18.715	N	27 52.036	E	16:27	5581	77 13.735	N	28 02.774	E	2D				Seismic over southern part of line 1.Changed the source to 15/30. Data may be noisy in some starting shots because the streamer was not fully stretched. Changed the shot rate from 5 to 4 at around shot no. 4545. Pressure was reduced from 150 to 140 around shot no. 4580. Channel 8, 23 are disabled. Reducing the pressure to 120 around shot 5294. Injector delay increased from 19 to 25 around shot 5345. Pressure increased to 140 around shot 5432
KKLP		CAGE19-2-HH-002-006-chirp	11.07.2019	12:30	4448	77 18.715	N	27 52.036	E	19:04		77 13	N	27 52	E	MB + chirp	2-8kHz,40ms			Doing chirp and MB over crater structure. MB092-108.
KKLP		CAGE19-2-HH-007-chirp	11.07.2019	19:07		77 13.890	N	27 52.016	E	19:17		77 14.757	N	28 03.392	E	MB + chirp	2-8kHz,40ms			MB110.
KKLP		CAGE19-2-HH-008-chirp	11.07.2019	19:17		77 14.757	N	28 03.392	E	19:45		77 18.053	N	27 56.328	E	MB + chirp	2-8kHz,40ms			MB112
KKLP		CAGE19-2-HH-009-chirp	11.07.2019	19:49		77 18.038	N	27 57.691	E	20:13		77 15.113	N	28 04.107	E	MB + chirp	2-8kHz,40ms			MB114
KKLP		CAGE19-2-HH-010-chirp	11.07.2019	20:15		77 15.202	N	28 04.766	E	23:18		77 38.041	N	28 36.294	E	MB + chirp	2-8kHz,40ms			MB116-123
KKLP		CAGE19-2-HH-010b-chirp	11.07.2019	23:37		77 38.150	N	28 36.455	E	08:52		78 15.434	N	30 41.543	E	MB + chirp	2-8kHz,40ms			CTD stnr747 was performed between 10 and 10b, for 010b-stnr748, CTD stnr749 was performed at MB 0135. MB126-145 .At UTC 08.03, ship speed is 7.9 kn.
KKLP		CAGE19-2-HH-011-chirp	12.07.2019	08:55		78 15.517	N	30 42.987	E	11:45		78 11.689	N	33 03.548	E	MB + chirp	2-8kHz,40ms			MB 147-152 . Speed of ship at start of line is 8.4 kn. At UTC 09:44, speed of ship is 10.3kn. At UTC 11.30, speedof ship is 10.2 kn.
KKLP		CAGE19-2-HH-012-chirp	12.07.2019	12:06		78 11.500	N	33 04.337	E	14:58		77 59.118	N	31 54.820	E	MB + chirp	2-8kHz,40ms			CTD str 751 performed between lines 11 and 12. Speed 8.1 at start of the line.MB0155-0160
KKLP		CAGE19-2-HH-013-chirp	12.07.2019	15:05		77 59.262	N	31 56.122	E	16:47		77 50.481	N	32 45.625	E	MB + chirp	2-8kHz,40ms			7,6 kn at start of line, 8,2 close to the end. MB0161-0164
KKLP		CAGE19-2-HH-014-chirp	12.07.2019	17:08		77 50.0430	N	32 21.004	E	18:23		77 59.096	N	32 20.621	E	MB + chirp	2-8kHz,40ms			CTD 753 perfomred between lines 13 and 14. MB0166 - MB0168
KKLP		CAGE19-2-HH-015-chirp	12.07.2019	18:29		77 59.039	N	32 22.919	E	00:02		77 20.913	N	30 47.141	E	MB + chirp	2-8kHz,40ms			MB170 -181 . At UTC time 20:36, speed of ship is 8.6 kn.
KKLP		CAGE19-2-HH-016-chirp	13.07.2019	00:11		77 20.848	N	30 50.646	E	05:02		77 17.044	N	33 01.391	E	MB + chirp	2-8kHz,40ms			MB 183-0192 .At UTC 00:16, speed of ship is 10.2 knots. CTD 754 performed within MB183 (**polar bear spot**). Stopped Chirp 016 recording at UTC 1.24. Started chirp 017 recording at UTC 1.32.
Storbanken		CAGE19-2-HH-017-chirp	13.07.2019	05:19		77 17.477	N	32 58.807	E	06:08		77 21.992	N	33 20.794	E	MB + chirp	2-8kHz,40ms			Continuing with Chirp file nr 17 to match up the numbers with the line. CTD 755 before starting the line. MTB 0193-194, stnr-756
Storbanken		CAGE19-2-HH-018-chirp	13.07.2019	06:12		77 22.059	N	33 19.780	E	07:08		77 17.575	N	32 55.012	E	MB + chirp	2-8kHz,40ms			MB 196-197, stnr-756
Storbanken		CAGE19-2-HH-019-chirp	13.07.2019	07:15		77 17.176	N	32 54.214	E	08:09		77 22.300	N	33 19.276	E	MB + chirp	2-8kHz,40ms			MB200-201, stnr-756
Storbanken		CAGE19-2-HH-020-chirp	13.07.2019	08:13		77 22.417	N	33 18.365	E	09:10		77 16.989	N	32 52.025	E	MB + chirp	2-8kHz,40ms			MB203-204, stnr-756
Storbanken		CAGE19-2-HH-021-chirp	13.07.2019	09:13		77 17.242	N	32 51.662	E	10:16		77 23.270	N	33 21.170	E	MB + chirp	2-8kHz,40ms			MB206-208, stnr-756
Storbanken		CAGE19-2-HH-022-chirp	13.07.2019	10:20		77 23.459	N	33 20.785	E	11:15		77 18.136	N	32 54.534	E	MB + chirp	2-8kHz,40ms			MB 210-211, stnr-756
Storbanken		CAGE19-2-HH-023-chirp	13.07.2019	11:18		77 18.359	N	32 54.074	E	12:07		77 22.865	N	33 16.111	E	MB + chirp	2-8kHz,40ms			MB213-214, STNR-756
Storbanken		CAGE19-2-HH-024-chirp	13.07.2019	12:14		77 23.050	N	33 15.033	E	13:02		77 18.622	N	32 53.864	E	MB + chirp	2-8kHz,40ms			MB0216-MB0217, STNR756
Storbanken		CAGE19-2-HH-0025-2D/chirp	13.07.2019	14:09	5682	77 16.073	N	32 45.009	E	16:47	8059	77 24.105	N	33 25.019	E	2D + MB + chirp	2-8kHz,40ms	0.25		MB219-MB225. Was initially named line 0003. Airgun - 140 bars. There are two chambers - 15/30 cubic inches and delay between chambers is 19ms. Channel 23, 8 are disabled. Station no. - 757. **Nav data not logged**
Storbanken		CAGE19-2-HH-0026-2D/chirp	13.07.2019	17:03	8060	77 23.997	N	33 22.663	E	18:10	9067	77 18.814	N	33 26.084	E	2D + MB + Chirp	2-8kHz,40ms	0.25		Was initially named line 0004. Channel 8, 23 are disabled. Channel 9 noisy, Station no.- 758, incomplete data 8947, serial string not detected 9019, incomplete data file 9026, gun timing delay 9058. Stop 9067. Start MB227 End MB229 **Nav data not logged**
Storbanken		CAGE19-2-HH-0027-2D/chirp	13.07.2019	18:18	9071	77 19.008	N	33 27.069	E	18:21	10841	77 24.520	N	32 56.373	E	2D + MB + Chirp	2-8kHz,40ms	0.25	4.5	Was initially named line 0005. MB 231-235, Chirp Line CAGE19-2-HH-0005-chirp, station no. 758, ship speed 4.5, gun interval 4 seconds. Channel 8 and 23 disabled, channel 9 noisy. For shot 10292, channels 1,2,3,9 are overdriven. For many shots after this, channels 1,2,3,4 and 9 are overdriven. Ship speed at 19:57 is 4.3 knots.
Storbanken		CAGE19-2-HH-0028-2D/chirp	13.07.2019	20:31	10842	77 24.504	N	32 58.403	E	22:20	12473	77 16.112	N	33 05.742	E	2D + MB + Chirp	2-8kHz,40ms	0.25	4.4	MB237-240. Speed 4.3. Stnr 758. Seismic: channel 8 and 23 disabled. Channel 1,2,3,4 and 9 overdriven for many shots. Channel 9 is very noisy. Gun delay 11.5 and injector delay 19ms (air pressure less than standard 140 bars). Airguns taken out.
Storbanken		CAGE19-2-HH-0029-chirp	13.07.2019	22:26		77 15.735	N	33 06.089	E	23:19		77 21.540	N	33 12.907	E	MB + Chirp	2-8kHz,40ms	0.25	9.8	MB242-243. After completing seismic, going towards CTD station so these recordings are during transit. CTD stnr759 performed after line 29. CTD completed at 23:41.
Storbanken		CAGE19-2-HH-0030-chirp	14.07.2019	00:29		77 21.897	N	33 14.812	E	01:36		77 28.715	N	33 53.055	E	MB + Chirp	2-8kHz,40ms	0.25	9.8	MB245-MB247. Last CTD ended at 00:14.Transit line to the next seismic location.

Storbanken	CAGE19-2-HH-0031-2D/chirp	14.07.2019	02:24	12480	77 28.679	N	33 48.431	E	05:05	14901	77 26.262	N	34 42.680	E	2D + MB + Chirp	2-8kHz,40ms	0.25	9.6	MB248-253. Speed 4.6 kn. Channel 8, 23 are disabled. Channel 1,2,3,4 and 9 are overdriven.
Storbanken	CAGE19-2-HH-0032-2D/chirp	14.07.2019	05:39	14902	77 25.822	N	34 39.232	E	07:33	16610	77 33.236	N	35 02.777	E	2D + MB + Chirp	2-8kHz,40ms	0.25		MB255-258. Speed 4.6 kn. Channel 8, 23 are disabled.
Storbanken	CAGE19-2-HH-0033-2D/chirp	14.07.2019	07:41	16611	77 32.914	N	35 04.663	E	08:31	17360	77 29.129	N	35 05.206	E	2D + MB + Chirp	2-8kHz,40ms	0.25	4.5	MB 260-261, strnr-762. channel 9 is noisy. Channel 8 and 23 is disabled.
Storbanken	CAGE19-2-HH-0034-2D/chirp	14.07.2019	08:40	17361	77 29.119	N	35 02.925	E	10:40	19157	77 34.579	N	34 30.678	E	2D + MB + Chirp	2-8kHz,40ms	0.25	4.5	MB263-266, strnr-762. channel 9 is noisy. Channel 8 and 23 is disabled.
Storbanken	CAGE19-2-HH-0035-2D/chirp	14.07.2019	10:50	19158	77 34.892	N	34 32.660	E	11:48	20029	77 36.201	N	34 51.666	E	2D + MB + Chirp	2-8kHz,40ms	0.25	4.6	MB268-269, stnr-762
Storbanken	CAGE19-2-HH-0036-2D/chirp	14.07.2019	11:59	20031	77 35.695	N	34 51.586	E	15:10	22902	77 23.858	N	34 12.243	E	2D + MB + Chirp	2-8kHz,40ms	0.25	4.5	MB271-277,stnr 762, change cooordinate system-> zone 32 to 35 UTM on Seatrack
Storbanken	CAGE19-2-HH-0037-chirp	14.07.2019	15:25		77 23.027	N	34 11.896	E	16:55		77 09.505	N	34 15.477	E	MB + Chirp	2-8kHz,40ms		10	MB0278-0281,stnr763
Storbanken	CAGE19-2-HH-0038-2D/chirp	14.07.2019	17:32	22903	77 09.014	N	34 18.384	E	21:03	26082	76 59.250	N	35 18.808	E	2D + MB + Chirp	2-8kHz,40ms	0.25	4.5	CTD stn764 performed before line. str765 MB0282-289. Airgun taken out after end of this line.
Storbanken	CAGE19-2-HH-0039-chirp	14.07.2019	21:28		76 59.09	N	35 21.04	E	23:11		77 06.880	N	34 32.804	E	MB + Chirp	2-8kHz,40ms		7.9	MB291-294, STATION NO766
Storbanken	CAGE19-2-HH-0040-chirp	14.07.2019	23:14		77 06.913	N	34 33.652	E	00:24		77 01.299	N	35 08.488	E	MB + Chirp	2-8kHz,40ms		8.2	MB296-MB298,station no766
Storbanken	CAGE19-2-HH-0041-chirp	15.07.2019	00:46		77 01.263	N	35 09.781	E	02:00		77 06.968	N	34 34.447	E	MB + Chirp	2-8kHz,40ms		7.7	CTD stnr767 before start of the line. MB 301-MB303. Station no. - 768
Storbanken	CAGE19-2-HH-0042-chirp	15.07.2019	02:05		77 07.220	N	34 34.450	E	03:18		77 01.537	N	35 09.671	E	MB + Chirp	2-8kHz,40ms		8	MB305-MB307. Station no. - 768
Storbanken	CAGE19-2-HH-0043-chirp	15.07.2019	03:23		77 01.683	N	35 10.339	E	04:37		77 07.301	N	34 35.510	E	MB + Chirp	2-8kHz,40ms		8.2	MB309-0311. Stnr - 768
Storbanken	CAGE19-2-HH-0044-chirp	15.07.2019	04:41		77 07.465	N	34 35.510	E	05:55		77 01.910	N	35 10.469	E	MB + Chirp	2-8kHz,40ms			MB0313-0315
Storbanken	CAGE19-2-HH-0045-chirp	15.07.2019	06:04		77 02.310	N	35 09.565	E	07:11		77 07.824	N	34 35.417	E	MB + chirp	2-8kHz,40ms		8.4	MB0317-319
Storbanken	CAGE19-2-HH-0046-chirp	15.07.2019	07:15		77 07.913	N	34 36.183	E	08:27		77 02.160	N	35 12.000	E	MB + chirp	2-8kHz,40ms		8.2	MB321-323. Chirp file saved in two parts- a and b.
Storbanken	CAGE19-2-HH-0047-chirp	15.07.2019	08:31		77 02.286	N	35 12.895	E	09:44		77 08.091	N	34 36.889	E	MB + chirp	2-8kHz,40ms		8.2	MB 325-327
Storbanken	CAGE19-2-HH-0048-MB														MB				MB 328-329. Chirp was not recorded
Storbanken	CAGE19-2-HH-0049-chirp	15.07.2019	10:45		77 04.383	N	35 01.767	E	11:32		77 08.342	N	34 38.333	E	MB + chirp	2-8kHz,40ms		8.1	MB 331-332
Storbanken	CAGE19-2-HH-0050-chirp	15.07.2019	11:38		77 08.470	N	34 39.132	E	12:25		77 04.694	N	35 02.671	E	MB + chirp	2-8kHz,40ms			MB 334-335
Storbanken	CAGE19-2-HH-0051-chirp	15.07.2019	12:33		77 04.795	N	35 03.509	E	13:20		77 08.602	N	34 39.669	E	MB + chirp	2-8kHz,40ms			MB 336- 337
Storbanken	CAGE19-2-HH-0052-chirp	15.07.2019	13:29		77 08.664	N	34 38.105	E	13:49		77 07.200	N	34 50.405	E	MB + chirp	2-8kHz,40ms		8	MB 338
Storbanken	CAGE19-2-HH-0053-chirp	15.07.2019	13:56		77 07.299	N	34 51.448	E	14:18		77 08.999	N	34 40.583	E	MB + chirp	2-8kHz,40ms		8	MB 340
Storbanken	CAGE19-2-HH-0054-chirp	15.07.2019	14:24		77 09.165	N	34 41.125	E	14:41		77 07.835	N	34 49.442	E	MB + chirp	2-8kHz,40ms		8.1	MB343
Storbanken	CAGE19-2-HH-0055-chirp	15.07.2019	14:47		77 07.963	N	34 50.308	E	15:04		77 09.316	N	34 41.77	E	MB + chirp	2-8kHz,40ms		8.1	MB346
Storbanken	CAGE19-2-HH-0056-chirp	15.07.2019	15:10		77 09.527	N	34 42.086	E	15:28		77 08.153	N	34 50.599	E	MB + chirp	2-8kHz,40ms		7.9	MB348
Storbanken	CAGE19-2-HH-0057-chirp	15.07.2019	15:34		77 07.433	N	34 50.044	E	15:50		77 05.114	N	34 45.124	E	MB + chirp	2-8kHz,40ms		8	MB350. This is a transit line.
Storbanken	CAGE19-2-HH-0058-SB	15.07.2019	16:01		77 04.920	N	34 46.36	E	22:12		77 03.554	N	34 54.507	E	SB			4	Single beam only
Storbanken	CAGE19-2-HH-0059-chirp	16.07.2019	02:19		77 11.058	N	34 18.570	E	04:06		77 23.245	N	33 22.302	E	MB + chirp	2-8kHz,40ms		4	MB351-MB355. This is a transit line. Stnr 774 (Water column was not recorded).
Storbanken	CAGE19-2-HH-0060-chirp	16.07.2019	04:22		77 23.4092	N	33 21.467	E	04:46		77 25.592	N	33 11.061	E	MB + chirp	2-8kHz,40ms		6.7	MB356. Stnr 776. Ship speed was continuously increasing upto 7.9 kn.
Storbanken	CAGE19-2-HH-0061-chirp	16.07.2019	04:55		77 25.709	N	33 11.576	E	05:20		77 23.569	N	33 21.648	E	MB + chirp	2-8kHz,40ms		7.8	MB358. Stnr 776
Storbanken	CAGE19-2-HH-0062-MB	16.07.2019			77 26.255	N	33 28.745	E				N		E	MB				Transit to start of seismic line. MB360
Storbanken	CAGE19-2-HH-0063-2D/chirp	16.07.2019	06:48	26180	77 26.4151	N	33 29.6568	E	09:23	28497	77 19.580	N	32 47.021	E	2D + MB + Chirp		0.25	4.7	MB 0362-367, chrip and MB line started earlier than 2D. Channels 8 and 23 turned off, Channel 9 noisy, shot rate 4 seconds, streamer leakage - affecting channel 24 - possible problem with AD connection
Storbanken	CAGE19-2-HH-0064-chirp	16.07.2019	09:52		77 20.3004	N	32 41.443	E	15:27		77 56.986	N	30 58.822	E	MB + Chirp			8	MB 369-MB380, Stnr 778
Storbanken	CAGE19-2-HH-0065-chirp	16.07.2019	15:54		77 57.115	N	30 55.354	E	16:28		77 54.567	N	30 36.417	E	MB + Chirp			8	MB383-MB384. Stnr 780
Storbanken	CAGE19-2-HH-0066-chirp	16.07.2019	16:28		77 54.567	N	30 36.417	E	21:14		77 32.0814	N	29 44.0671	E	MB + Chirp			8	MB385-394. Stnr 780. Reduced speed to 4.5 knots at c. 1830 while sailing through sea ice.
Storbanken	CAGE19-2-HH-0068-2D/chirp	16.07.2019	22:16	325	77 32.1522	N	29 33.1169	E	03:32	5045	77 12.754	N	28 39.148	E	2D + MB + Chirp		0.25	4.5	Stnr 781, Line 067 was skipped. Started new survey KKLP_0716 with line 068. First SEGD file of line 068 is starting at 68 and not 1. MB 397-407. Record length 3 sec. Sample interval 0.25 ms. Speed 4.5 knots. Shot rate 4 sec. New streamer order. Prior to start of this line streamers changed as a result of streamer 1 leaking. New streamer 1 is old streamer 2, streamer 2 is brand new, streamer 3 and 4 is same as old 3 and 4.Channel 16 is low which was the old channel 8. Channel 23 is dead. Unusual noisy channels at the end of the streamer (last section) 28-32 noisy - settled out.
Storbanken	CAGE19-2-HH-0069-2D/chirp	17.07.2019	03:34	5046	77 12.760	N	28 38.646	E	04:38	5999	77 12.843	N	28 15.569	E	2D + MB + Chirp			4.6	Channel 16, 23 are disabled. The same file with coordinates for lines 68 and 69. MB409-410
Storbanken	CAGE19-2-HH-0070-2D/chirp	17.07.2019	04:42	6000	77 12.874	N	28 15.312	E	06:26	7558	77 18.322	N	27 38.743	E	2D + MB + Chirp			4.6	First 15 shots of very poor quality on some channels, muting required. MB 412-415. Stnr 781. 07:16 MB turned off, last station 418.
Storbanken	CAGE19-2-HH-0071-chirp	17.07.2019	09:04		77 17.303	N	27 56.233	E	09:20		77 15.333	N	27 55.409	E	MB+ Chirp			4.6	Survey to locate flares for coring. MB419 (stnr-783)
Storbanken	CAGE19-2-HH-0072-chirp	17.07.2019	13:10		77 15.641	N	27 55.679	E	13:52		77 11.793	N	27 32.487	E	MB+ Chirp			9.2	Transit line to seismic shoot MB0422 stnr787
Storbanken	CAGE19-2-HH-0073-2D/chirp	17.07.2019	14:44	7597	77 12.361	N	27 37.251	E	16:54	9538	77 18.44	N	28 08.048	E	2D + MB + Chirp			4.5	MB426-MB429 . Nav data was not logged for shots 7559 - 7596 because ship was a bit offtrack. Ship speed was decreased to less than 2 for lowering the retractable keel for better stability. Ship speed was again back to 4.0 kn at shot no. 7731. Channel 16 is a bit noisy. Ship speed was 4.5 kn at around shot no. 7800. Stnr - 789
Storbanken	CAGE19-2-HH-0074-chirp	17.07.2019	17:26		77 18.813	N	28 07.877	E	18:30		77 26.224	N	28 24.969	E	MB+ Chirp				Line to test quality of MB in rough weather. MB0431-433
Storbanken	CAGE19-2-HH-0075-chirp	17.07.2019	18:35		77 26.310	N	28 22.849	E	19:54		77 16.560	N	28 01.570	E	MB+ Chirp			8.7	MB 435-437
Storbanken	CAGE19-2-HH-0076-chirp	17.07.2019	20:00		77 16.770	N	28 00.888	E	21:51		77 30.811	N	28 31.954	E	MB+ Chirp				MB 439-442
Storbanken	CAGE19-2-HH-0077-chirp	17.07.2019	21:54		77 30.706	N	28 32.730	E	22:28		77 26.358	N	28 23.176	E	MB+ Chirp			8.8	MB 444
Storbanken	CAGE19-2-HH-0078-chirp	17.07.2019	22:34		77 26.080	N	28 26.209	E	23:54		77 22.998	N	29 16.393	E	MB+ Chirp			9	MB 446-449
Storbanken	CAGE19-2-HH-0079-chirp	18.07.2019	00:02		77 24.055	N	29 19.090	E	00:18		77 25.874	N	27 23.487	E	MB+ Chirp			8	MB 451-MB451
Storbanken	CAGE19-2-HH-0080-chirp	18.07.2019	00:50		77 25.969	N	29 22.660	E	02:38		77 13.352	N	28 52.487	E	MB+ Chirp			8.2	MB454-457
Storbanken	CAGE19-2-HH-0081-chirp	18.07.2019	02:45		77 13.447	N	28 51.634	E	04:38		77 26.036	N	29 21.794	E	MB+ Chirp			8	MB459 -0463
Storbanken	CAGE19-2-HH-0082-chirp	18.07.2019	04:45		77 26.132	N	29 20.964	E	06:33		77 13.401	N	28 50.434	E	MB+ Chirp			7.6	MB465-468

Storbanken		CAGE19-2-HH-0083-chirp	18.07.2019	06:37		77 13.609	N	28 49.928	E	08:24		77 26.331	N	29 20.372	E	MB+ Chirp			MB 470-473
Storbanken		CAGE19-2-HH-0084-chirp	18.07.2019	08:33		77 25.765	N	29 24.277	E	10:16		77 13.104	N	28 53.986	E	MB+ Chirp		9.6	MB 475-478
Storbanken		CAGE19-2-HH-0085-chirp	18.07.2019	10:21		77 12.940	N	28 54.599	E	12:12		77 25.661	N	29 25.114	E	MB+ Chirp		6.7	MB 480-483
Storbanken		CAGE19-2-HH-0086-chirp	18.07.2019	12:18		77 25.553	N	29 25.977	E	13:46		77 15.273	N	29 01.241	E	MB+ Chirp		8	MB 485-488
Storbanken		CAGE19-2-HH-0087-chirp	18.07.2019	13:52		77 15.150	N	29 01.943	E	14:29		77 19.251	N	29 11.726	E	MB+ Chirp		8.1	MB 490-491
Storbanken		CAGE19-2-HH-0087-chirp	18.07.2019	14:31		77 19.530	N	29 11.855	E	14:43		77 19.380	N	29 06.862	E	MB + Chirp		8	MB 494 Short transit cross-line for detailed MB study.
Storbanken		CAGE19-2-HH-0088-chirp	18.07.2019	15:16		77 18.986	N	29 06.896	E	15:42		77 17.126	N	29 07.304	E	MB+ Chirp		4.3	Doubled the ping rate for MB, speed reduced to 4.5 kn. Single beam and chirp disabled from now on. MB 496. No water column data logged for this line.
Storbanken		CAGE19-2-HH-0089-MB	18.07.2019	15:50		77 17.112	N	29 06.833	E	16:14		77 18.828	N	29 06.452	E	MB		4.3	MB 498
Storbanken		CAGE19-2-HH-0090-MB	18.07.2019	16:19		77 18.830	N	29 05.984	E	16:44		77 17.112	N	29 06.369	E	MB		4.5	MB 500
Storbanken		CAGE19-2-HH-0091-MB	18.07.2019	16:48		77 17.100	N	29 05.899	E	17:09		77 18.825	N	29 05.507	E	MB		4.8	MB 502
Storbanken		CAGE19-2-HH-0092-MB	18.07.2019	17:13		77 18.813	N	29 05.050	E	17:38		77 17.097	N	29 05.429	E	MB		4.7	MB 504
Storbanken		CAGE19-2-HH-0093-MB	18.07.2019	17:41		77 17.093	N	29 04.967	E	18:04		77 18.866	N	29 04.553	E	MB		4.7	MB 506
Storbanken		CAGE19-2-HH-0094-MB	18.07.2019	18:10		77 18.774	N	29 04.112	E	18:35		77 16.884	N	29 04.542	E	MB		4.6	MB 508
Prins Karls Forland		CAGE19-2-HH-0095-MB	21.07.2019	05:34		78 33.111	N	10 12.180	E	06:05		78 34.540	N	10 04.170	E	MB		4.3	MB 016-17. 4.5 knots. 20-20 TVG for lines 0-20. Switched to 15-20.
Prins Karls Forland		CAGE19-2-HH-0096-MB	21.07.2019	09:20		78 33.068	N	10 04.716	E	09:45		78 34.462182	N	10 10.81223	E	MB		4.7	MB 029-31
Prins Karls Forland		CAGE19-2-HH-0097-MB	21.07.2019	10:35		78 33.382	N	10 08.436	E	10:49		78 33.832	N	10 05.594	E	MB		4.1	Start of the grid survey for multibeam MB32
Prins Karls Forland		CAGE19-2-HH-0098-MB	21.07.2019	10:57		78 34.157	N	10 06.597	E	11:12		78 33.412	N	10 10.766	E	MB		4.5	MB 34
Prins Karls Forland		CAGE19-2-HH-0099-MB	21.07.2019	11:19		78 33.297	N	10 09.361	E	11:34		78 34.049	N	10 05.189	E	MB		4.8	MB 36
Prins Karls Forland		CAGE19-2-HH-0100-MB	21.07.2019	11:40		78 34.253	N	10 06.291	E	11:55		78 33.539	N	10 10.457	E	MB		4.6	MB 38
Prins Karls Forland		CAGE19-2-HH-0101-MB	21.07.2019	12:05		78 33.421	N	10 09.045	E	12:20		78 34.122	N	10 05.401	E	MB		4	MB 40
Prins Karls Forland		CAGE19-2-HH-0102-MB	21.07.2019	12:30		78 34.262	N	10 06.914	E	12:45		78 34 .072	N	10 07.456	E	MB		4.6	MB 42
Prins Karls Forland		CAGE19-2-HH-0103-MB	21.07.2019	13:06		78 34 .236	N	10 07.050	E	13:21		78 33.585	N	10 10.619	E	MB		4.6	MB 44
Prins Karls Forland		CAGE19-2-HH-0104-MB	21.07.2019	13:29		78 33 .378	N	10 09.763	E	13:45		78 34.113	N	10 05.614	E	MB		4.5	MB 46
Prins Karls Forland		CAGE19-2-HH-0105-MB	21.07.2019	13:50		78 34.316	N	10 06.747	E	14:06		78 33.601	N	10 10.847	E	MB		4.4	MB 48
Prins Karls Forland		CAGE19-2-HH-0106-MB	21.07.2019	14:14		78 33.467	N	10 09.628	E	14:30		78 34.166	N	10 05.703	E	MB		4.3	MB 50
Prins Karls Forland		CAGE19-2-HH-0107-MB	21.07.2019	14:36		78 34.365	N	10 07.244	E	14:53		78 33.608	N	10 11.007	E	MB		4.5	MB 52
Prins Karls Forland		CAGE19-2-HH-0108-MB	21.07.2019	14:58		78 33.479	N	10 09.990	E	15:13		78 34.096	N	10 06.509	E	MB		4.3	MB 54
.		CAGE19-2-HH-0109-SB	21.07.2019	15:23		78 33 .909	N	10 07.956	E	15:26		78 33.776	N	10 08.670	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0110-SB	21.07.2019	15:34		78 33.734	N	10 08.464	E	######		78 33.876	N	10 07.652	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0111-SB	21.07.2019	15:48:54		78 33.911	N	10 07.888	E	######		78 33.800	N	10 08.505	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0112-SB	21.07.2019	16:01:51		78 33.759	N	10 08.316	E	######		78 33.869	N	10 07.699	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0113-SB	21.07.2019	16:15		78 33.908	N	10 07.874	E	######		78 33.797	N	10 08.491	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0114-SB	21.07.2019	16:27:02		78 33.755	N	10 08.302	E	######		78 33.866	N	10 07.685	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0115-SB	21.07.2019	16:39:19		78 33.904	N	10 07.859	E	######		78 33.794	N	10 08.476	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0116-SB	21.07.2019	16:51:34		78 33.632	N	10 08.648	E	######		78 33.863	N	10 07.670	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0117-SB	21.07.2019	17:05:12		78 33.901	N	10 07.845	E	######		78 33.791	N	10 07.462	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0118-SB	21.07.2019	17:17:22		78 33.749	N	10 08.273	E	######		78 33.860	N	10 07.656	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0119-SB	21.07.2019	17:30:59		78 33.898	N	10 07.830	E	17:33		78 33.787	N	10 08.447	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0120-SB	21.07.2019	17:43:34		78 33.746	N	10 08.258	E	######		78 33.857	N	10 07.641	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0121-SB	21.07.2019	17:56:11		78 33.895	N	10 07.816	E	######		78 33.784	N	10 08.433	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0122-SB	21.07.2019	18:06:38		78 33.747	N	10 08.238	E	######		78 33.855	N	10 07.620	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0123-SB	21.07.2019	18:17:49		78 33.891	N	10 07.801	E	######		78 33.781	N	10 08.429	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0124-SB	21.07.2019	18:29:02		78 33.741	N	10 08.226	E	######		78 33.851	N	10 07.598	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0125-SB	21.07.2019	18:41:22		78 33.888	N	10 07.800	E	######		78 33.778	N	10 08.417	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0126-SB	21.07.2019	18:53:33		78 33.738	N	10 08.196	E	######		78 33.851	N	10 07.575	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0127-SB	21.07.2019	19:06:25		78 33.886	N	10 07.776	E	######		78 33.774	N	10 08.397	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0128-SB	21.07.2019	19:18:33		78 33.737	N	10 08.172	E	######		78 33.861	N	10 07.511	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0129-SB	21.07.2019	19:40:02		78 33.881	N	10 07.762	E	######		78 33.773	N	10 08.386	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0130-SB	21.07.2019	19:51:40		78 33.732	N	10 08.173	E	######		78 33.843	N	10 07.572	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0131-SB	21.07.2019	20:04:47		78 33.879	N	10 07.752	E	######		78 33.766	N	10 08.373	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0132-SB	21.07.2019	20:16:31		78 33.730	N	10 08.169	E	######		78 33.839	N	10 07.556	E	SB		ca. 4	
Prins Karls Forland		CAGE19-2-HH-0133-MB	21.07.2019	20:34:00		78 33.876	N	10 07.721	E	######		78 33.765	N	10 08.355	E	MB			Moving to start point of MB survey. 20:58 Multibeam turned on
Prins Karls Forland		CAGE19-2-HH-0134-MB	21.07.2019	21:15		78 32.232	N	10 21.877	E	21:54		78 36.209	N	10 05.8033	E	MB		8	MB57-58
Prins Karls Forland		CAGE19-2-HH-0135-MB	21.07.2019	21:57		78 36.131	N	10 05.346	E	22:36		78 32.076	N	10 21.711	E	MB			MB 60-61
Prins Karls Forland		CAGE19-2-HH-0136-MB	21.07.2019	22:39		78 32.042	N	10 21.226	E	23:16		78 36.053	N	10 05.055	E	MB			MB 63-64
Prins Karls Forland		CAGE19-2-HH-0137-MB	21.07.2019	23:20		78 36.021	N	10 04.443	E	23:59		78 31.88	N	10 21.069	E	MB			MB66-MB67
Prins Karls Forland		CAGE19-2-HH-0138-MB	22.07.2019	00:04		78 31.92	N	10 20.292	E	00:42		78 35.927	N	10 04.141	E	MB			MB69-MB70
Prins Karls Forland		CAGE19-2-HH-0139-MB	22.07.2019	00:48		78 35.868	N	10 03.633	E	01:27		78 31.867	N	10 19.804	E	MB			MB72-MB73
Prins Karls Forland		CAGE19-2-HH-0140-MB	22.07.2019	01:32		78 31.775	N	10 19.458	E	02:10		78 35.795	N	10 03.292	E	MB			MB75-MB76
Prins Karls Forland		CAGE19-2-HH-0141-MB	22.07.2019	02:16		78 35.735	N	10 02.773	E	02:55		78 31.717	N	10 19.012	E	MB			MB78-MB79
Prins Karls Forland		CAGE19-2-HH-0142-MB	22.07.2019	03:01		78 31.648	N	10 18.558	E	03:38		78 35.656	N	10 02.461	E	MB			MB81-MB82
Prins Karls Forland		CAGE19-2-HH-0143-MB	22.07.2019	03:44		78 35.593	N	10 01.964	E	04:23		78 31.611	N	10 18.056	E	MB			MB84-MB85
Prins Karls Forland		CAGE19-2-HH-0144-MB	22.07.2019	04:26		78 31.516	N	10 17.744	E	05:04		78 35.518	N	10 01.625	E	MB			MB87-MB88
Prins Karls Forland		CAGE19-2-HH-0145-MB	22.07.2019	05:12		78 35.468	N	10 01.107	E	05:51		78 31.465	N	10 17.262	E	MB			MB90-MB91
Prins Karls Forland		CAGE19-2-HH-0146-MB	22.07.2019	05:54		78 31.394	N	10 16.912	E	06:29		78 35.432	N	10 00.508	E	MB			MB93-MB94 end of line MB_26
Prins Karls Forland		CAGE19-2-HH-0147-MB	22.07.2019	06:33		78 35.270	N	10 00.520	E	07:11		78 31.333	N	10 16.407	E	MB		8	Start of line MB_27 MB96-97
Prins Karls Forland		CAGE19-2-HH-0148-MB	22.07.2019	07:15		78 31.289	N	10 15.966	E	07:50		78 35.235	N	9 59.983	E	MB			MB99-100
Prins Karls Forland		CAGE19-2-HH-0149-MB	22.07.2019	07:53		78 35.208	N	0 59.371	E	08:31		78 31.218	N	10 15.485	E	MB			MB 102-103

Prins Karls Forland		CAGE19-2-HH-0150-MB	22.07.2019	08:35		78 31.120	N	10 15.289	E	09:11		78 35.209	N	9 58.695	E	MB				MB 105-106
Prins Karls Forland		CAGE19-2-HH-0151-MB	22.07.2019	09:13		78 35.092	N	9 58.464	E				N		E	MB				MB 108-109. forgot to note down end coordinates
Prins Karls Forland		CAGE19-2-HH-0152-MB	22.07.2019	10:01		78 31.689	N	10 11.524	E	10:30		78 35.000	N	9 58.159	E	MB				MB110.
Prins Karls Forland		CAGE19-2-HH-0153-MB	22.07.2019	10:34		78 34.927	N	9 57.761	E	11:10		78 30.924	N	10 13.893	E	MB				MB 112-113. 13:34 MB stopped. MB 114-116. Ship anchored.
Prins Karls Forland		CAGE19-2-HH-0154-MB	22.07.2019	15:20		78 33.414	N	10 08.302	E	15:30		78 33.837	N	10 05.931	E	MB				MB Survey started after deplotment of the Lander. MB 116. station no 809
Prins Karls Forland		CAGE19-2-HH-0155-MB	22.07.2019	15:37		78 34.068	N	10 07.050	E	15:43		78 33.790	N	10 08.613	E	MB				MB 118. stnr-809
Prins Karls Forland		CAGE19-2-HH-0156-MB	22.07.2019	15:53		78 33.449	N	10 08.488	E	16:00		78 33.871	N	10 06.136	E	MB				MB 120
Prins Karls Forland		CAGE19-2-HH-0157-MB	22.07.2019	16:10		78 34.111	N	10 07.277	E	16:21		78 33.689	N	10 09.579	E	MB				MB 122
Prins Karls Forland		CAGE19-2-HH-0158-MB	22.07.2019	16:27		78 33.489	N	10 08.669	E	16:38		78 33.911	N	10 06.318	E	MB				MB 124
Prins Karls Forland		CAGE19-2-HH-0159-MB	22.07.2019	16:43		78 34.151	N	10 07.409	E	16:56		78 33.728	N	10 09.761	E	MB				MB 126
Prins Karls Forland		CAGE19-2-HH-0160-MB	22.07.2019	17:01		78 33.529	N	10 08.851	E	17:12		78 33.951	N	10 06.499	E	MB				MB 128
Prins Karls Forland		CAGE19-2-HH-0161-MB	22.07.2019	17:17		78 34.190	N	10 07.591	E	17:30		78 33.768	N	10 09.943	E	MB				MB 130
Prins Karls Forland		CAGE19-2-HH-0162-MB	22.07.2019	17:34		78 33.569	N	10 09.033	E	17:46		78 33.991	N	10 06.681	E	MB				MB 132
Prins Karls Forland		CAGE19-2-HH-0163-MB	22.07.2019	17:51		78 34.263	N	10 07.587	E	18:05		78 34.338	N	10 10.125	E	MB				MB 134.stnr-809
Prins Karls Forland		CAGE19-2-HH-0164-MB	22.07.2019	18:16		78 33.609	N	10 09.212	E	18:27		78 34.031	N	10 06.863	E	MB				MB 136.stnr-809. This is end of MB. CTD done after this.
Prins Karls Forland		CAGE19-2-HH-0165-SB	22.07.2019	19:15		78 33.760	N	10 08.269	E	19:17		78 33.881	N	10 07.614	E	SB				SB survey being done over lander area.
Prins Karls Forland		CAGE19-2-HH-0166-SB	22.07.2019	19:35		78 33.739	N	10 08.311	E	19:37		78 33.884	N	10 07.609	E	SB				
Prins Karls Forland		CAGE19-2-HH-0167-SB	22.07.2019	19:53		78 33.742	N	10 08.344	E	19:55		78 33.876	N	10 07.582	E	SB			5	
Prins Karls Forland		CAGE19-2-HH-0168-SB	22.07.2019	20:11		78 33.759	N	10 08.338	E	20:13		78 33.890	N	10 07.618		SB			5	
Prins Karls Forland		CAGE19-2-HH-0169-SB	22.07.2019	20:28		78 33.739		10 08.327		20:30		78 33.879		10 07.554		SB				
Prins Karls Forland		CAGE19-2-HH-0170-SB	22.07.2019	20:43		78 33.882		10 07.693		20:45		78 33.754		10 08.417		SB				
Prins Karls Forland		CAGE19-2-HH-0171-SB	22.07.2019	20:55		78 33.740		10 08.285		20:58		78 33.869		10 07.563		SB				Survey finished

CruiseNr	Date (UTC)	Time (UTC)	Logg (nm)	Stasjonstype	StNr	Kommentar	Speed	Latitude	Longitude	Depth (m)	Air Temp (°C)	Water Temp (°C)	Wind Speed (m/s)	Humidity (%)	Wind dir (deg)
09072019	11.07.2019	04:54:39	8890.46	CTD med vannhenter START	738		0.3	7706.686778 N	02818.147394 E	191.27	1.1	2.2	0.6	95.5	343.7
09072019	11.07.2019	05:04:01	8890.55	CTD med vannhenter STOPP	738		0.7	7706.758423 N	02817.976193 E	192.08	0.9	2.4	1.4	95.5	14.2
09072019	11.07.2019	06:19:12	8893.92	Seismisk profil START	739		2.9	7708.717840 N	02815.457202 E	183.66	0.9	2.7	2.7	95.5	41.9
09072019	11.07.2019	06:44:48	8895.71	Seismisk profil STOPP	739		4.0	7710.324538 N	02811.964748 E	173.82	1.0	2.4	2.7	95.8	59.4
09072019	11.07.2019	08:00:55	8899.34	Seismisk profil START	740		4.7	7710.442197 N	02811.737902 E	175.55	1.8	2.3	2.0	95.2	84.9
09072019	11.07.2019	12:30:30	8919.07	Seismisk profil STOPP	740		4.4	7728.134098 N	02732.775890 E	165.23	-0.4	-0.1	2.9	96.0	20.3
09072019	11.07.2019	12:54:35	8919.78	CTD med vannhenter START	741		0.4	7728.486366 N	02730.426834 E	165.05	-0.7	-0.6	2.9	96.0	18.9
09072019	11.07.2019	13:02:24	8919.86	CTD med vannhenter STOPP	741		0.7	7728.465650 N	02730.080548 E	164.86	-0.6	-0.6	2.8	96.0	28.7
09072019	11.07.2019	13:30:24	8921.06	Multibeam survey START	742	+Chirp	7.1	7727.935044 N	02731.325909 E	164.46	-0.3	-0.4	2.4	95.9	24.4
09072019	11.07.2019	14:31:48	8930.42	Multibeam survey STOPP	742	+Chirp	2.3	7719.611665 N	02750.152877 E	166.66	-0.1	1.5	2.9	95.7	214.6
09072019	11.07.2019	15:11:11	8931.43	Seismisk profil START	743		1.8	7718.692468 N	02752.085031 E	163.97	0.1	1.7	2.9	95.8	216.1
09072019	11.07.2019	16:28:11	8936.59	Seismisk profil STOPP	743		3.8	7714.051834 N	02802.174211 E	169.93	0.4	1.9	4.5	96.1	247.7
09072019	11.07.2019	16:45:50	8937.11	CTD med vannhenter START	744		0.7	7713.615632 N	02803.377206 E	168.76	0.6	1.8	3.1	96.1	256.9
09072019	11.07.2019	16:55:36	8937.19	CTD med vannhenter STOPP	744		0.5	7713.570952 N	02803.693430 E	166.37	0.5	1.8	3.6	96.1	261.8
09072019	11.07.2019	17:05:18	8937.98	Multibeam survey START	745	+Chirp	7.9	7713.854059 N	02801.355537 E	175.66	0.5	1.6	3.5	96.0	255.2
09072019	11.07.2019	20:12:23	8962.61	Multibeam survey STOPP	745	+Chirp	7.9	7715.266335 N	02803.748497 E	173.68	0.2	2.0	4.5	96.3	236.9
09072019	11.07.2019	20:30:24	8964.99	Multibeam survey START	746	+Chirp	8.2	7717.110364 N	02803.863688 E	202.70	0.3	2.8	2.7	96.2	245.2
09072019	11.07.2019	23:18:04	8987.60	Multibeam survey STOPP	746	+Chirp	2.4	7738.041844 N	02836.285497 E	193.15	-1.9	1.2	2.1	96.3	225.2
09072019	11.07.2019	23:20:41	8987.65	CTD med vannhenter START	747		0.8	7738.008396 N	02836.437257 E	192.20	-1.9	1.2	1.8	96.3	228.4
09072019	11.07.2019	23:30:19	8987.76	CTD med vannhenter STOPP	747		0.4	7737.902455 N	02836.391186 E	193.56	-1.8	0.2	1.6	96.4	246.8
09072019	11.07.2019	23:36:20	8988.03	Multibeam survey START	748	chirp	5.4	7738.040920 N	02836.067768 E	193.31	-1.8	-0.3	1.3	96.4	232.8

CruiseNr	Date (UTC)	Time (UTC)	Logg (nm)	Stasjonstype	StNr	Kommentar	Speed	Latitude	Longitude	Depth (m)	Air Temp (°C)	Water Temp (°C)	Wind Speed (m/s)	Humidity (%)	Wind dir (deg)
09072019	12.07.2019	08:53:33	9036.58	Multibeam survey STOPP	748	chirp	8.5	7815.491712 N	03041.843428 E	248.61	0.7	0.2	3.9	94.3	226.1
09072019	12.07.2019	03:51:20	9003.88	CTD med vannhenter START	749		0.3	7751.196723 N	02916.128305 E	286.73	-2.1	-0.8	2.8	95.7	267.9
09072019	12.07.2019	04:04:29	9004.03	CTD med vannhenter STOPP	749		0.9	7751.291420 N	02916.609257 E	283.82	-1.8	-1.0	3.1	95.8	261.2
09072019	12.07.2019	08:55:08	9036.79	Multibeam survey START	750	chirp	7.4	7815.527790 N	03042.711674 E	248.40	0.2	0.6	5.5	93.9	233.6
09072019	12.07.2019	11:46:32	9065.93	Multibeam survey STOPP	750	chirp	2.0	7811.669568 N	03303.622632 E	155.92	0.0	0.7	4.5	96.0	247.2
09072019	12.07.2019	11:46:57	9065.94	CTD med vannhenter START	751		1.3	7811.661898 N	03303.618213 E	155.84	0.0	0.7	4.3	96.0	244.9
09072019	12.07.2019	11:54:43	9066.06	CTD med vannhenter STOPP	751		0.9	7811.593483 N	03303.182409 E	156.79	0.2	0.8	3.8	96.0	248.8
09072019	12.07.2019	12:05:24	9066.72	Multibeam survey START	752	Chirp	6.3	7811.525699 N	03304.367843 E	158.29	0.2	0.9	4.7	95.9	254.9
09072019	12.07.2019	16:51:51	9104.44	CTD med vannhenter START	753		0.3	7750.280126 N	03246.141195 E	163.98	0.3	0.7	4.6	96.2	240.3
09072019	12.07.2019	16:59:47	9104.48	CTD med vannhenter STOPP	753		0.5	7750.299271 N	03246.002008 E	163.84	0.3	1.0	5.1	96.1	244.3
CruiseNr	Date (UTC)	Time (UTC)	Logg (nm)	Stasjonstype	StNr	Kommentar	Speed	Latitude	Longitude	Depth (m)	Air Temp (°C)	Water Temp (°C)	Wind Speed (m/s)	Humidity (%)	Wind dir (deg)
09072019	13.07.2019	05:08:31	9195.49	Multibeam survey STOPP	752		0.1	7717.280246 N	03257.998404 E	157.27	1.0	1.5	2.4	93.8	296.0
09072019	13.07.2019	01:12:05	9167.02	CTD med vannhenter START	754		0.3	7722.079219 N	03103.887702 E	187.51	0.2	0.4	3.8	94.9	334.8
09072019	13.07.2019	01:20:44	9167.07	CTD med vannhenter STOPP	754		0.4	7722.073761 N	03103.694298 E	187.30	0.3	0.6	4.1	94.8	327.6
09072019	13.07.2019	05:06:03	9195.48	CTD med vannhenter START	755		0.8	7717.274227 N	03257.977334 E	156.33	1.0	0.8	2.5	93.8	285.4
09072019	13.07.2019	05:13:49	9195.53	CTD med vannhenter STOPP	755		0.4	7717.315036 N	03258.054051 E	157.62	1.1	0.8	2.4	93.8	292.1
09072019	13.07.2019	05:19:04	9195.75	Multibeam survey START	756	Chirp	7.8	7717.476627 N	03258.763770 E	158.15	1.1	0.5	2.6	93.7	289.3
09072019	13.07.2019	13:04:26	9259.41	Multibeam survey STOPP	756	Chirp	8.1	7718.422991 N	03252.943109 E	152.39	1.1	1.1	4.0	93.0	340.5
09072019	13.07.2019	14:05:00	9265.56	Seismisk profil START	757		4.5	7715.856548 N	03243.903491 E	161.50	1.8	1.4	2.9	90.1	358.1
09072019	13.07.2019	16:46:59	9277.80	Seismisk profil STOPP	757		4.5	7724.060010 N	03324.825282 E	146.88	1.3	1.1	1.5	91.1	5.1
09072019	13.07.2019	17:04:00	9279.08	Seismisk profil START	758		4.1	7723.916171 N	03322.718158 E	147.27	1.0	1.0	1.2	92.0	353.5
09072019	13.07.2019	22:20:09	9302.91	Seismisk profil STOPP	758		4.9	7716.115976 N	03305.738652 E	165.57	1.2	1.4	2.2	92.4	352.1
09072019	13.07.2019	23:24:33	9310.50	CTD med vannhenter START	759		0.4	7721.563111 N	03312.909475 E	135.82	0.8	1.7	2.0	93.7	68.2
09072019	13.07.2019	23:41:00	9310.55	CTD med vannhenter STOPP	759		0.1	7721.552942 N	03312.896294 E	135.40	0.8	1.8	1.6	93.7	33.9

CruiseNr	Date (UTC)	Time (UTC)	Logg (nm)	Stasjonstype	StNr	Kommentar	Speed	Latitude	Longitude	Depth (m)	Air Temp (°C)	Water Temp (°C)	Wind Speed (m/s)	Humidity (%)	Wind dir (deg)
09072019	14.07.2019	00:00:48	9310.72	CTD med vannhenter START	760		0.6	7721.554415 N	03312.903732 E	135.79	0.5	2.0	3.0	94.0	74.5
09072019	14.07.2019	00:14:39	9310.76	CTD med vannhenter STOPP	760		0.3	7721.555557 N	03312.850136 E	135.55	0.5	1.7	2.7	94.6	76.7
09072019	14.07.2019	00:24:50	9310.88	Multibeamprofil START	761	Chirp	3.9	7721.572927 N	03312.972876 E	135.20	0.4	1.5	2.8	94.7	79.9
09072019	14.07.2019	01:39:24	9322.58	Multibeamprofil STOPP	761	Chirp	9.9	7728.913113 N	03351.916947 E	182.08	0.3	0.4	2.5	88.8	54.2
09072019	14.07.2019	02:24:17	9325.78	Seismisk profil START	762		4.5	7728.675241 N	03348.526294 E	178.29	0.7	-0.2	1.8	87.1	102.5
09072019	14.07.2019	15:10:59	9382.56	Seismisk profil STOPP	762		4.7	7723.817553 N	03412.106998 E	154.80	2.5	0.6	2.5	73.4	45.2
09072019	14.07.2019	15:30:58	9383.80	Multibeam survey START	763	chirp	8.9	7723.061994 N	03411.862125 E	159.49	1.8	1.8	3.6	76.5	11.4
09072019	14.07.2019	16:53:28	9397.48	Multibeam survey STOPP	763	chirp	6.0	7709.552196 N	03415.420784 E	169.13	1.4	2.0	3.3	84.8	358.8
09072019	14.07.2019	16:55:33	9397.57	CTD med vannhenter START	764		0.7	7709.498257 N	03415.251195 E	171.96	1.2	2.8	3.5	83.0	7.0
09072019	14.07.2019	17:04:25	9397.62	CTD med vannhenter STOPP	764		0.4	7709.482964 N	03415.070830 E	173.40	0.7	3.0	3.0	87.0	5.8
09072019	14.07.2019	17:29:05	9398.43	Seismisk profil START	765		4.3	7709.143639 N	03417.592998 E	184.35	1.2	3.4	3.2	86.2	8.8
09072019	14.07.2019	21:03:44	9415.37	Seismisk profil STOPP	765		4.6	7659.258434 N	03518.759965 E	121.27	0.3	2.5	0.9	90.1	340.6
09072019	14.07.2019	21:27:36	9416.61	Multibeam survey START	766	+ chirp	7.0	7659.024074 N	03521.576763 E	120.81	0.2	2.8	3.3	90.4	47.5
CruiseNr	Date (UTC)	Time (UTC)	Logg (nm)	Stasjonstype	StNr	Kommentar	Speed	Latitude	Longitude	Depth (m)	Air Temp (°C)	Water Temp (°C)	Wind Speed (m/s)	Humidity (%)	Wind dir (deg)
09072019	15.07.2019	15:29:44	9560.90	Multibeam survey STOPP	766		7.6	7708.015726 N	03451.275817 E	146.53	0.7	2.6	1.7	90.9	216.0
09072019	15.07.2019	00:31:24	9441.03	CTD med vannhenter START	767		0.7	7700.851941 N	03511.487029 E	115.54	0.3	2.2	3.1	88.1	354.8
09072019	15.07.2019	00:37:38	9441.05	CTD med vannhenter STOPP	767		0.3	7700.843624 N	03511.559762 E	116.38	0.3	2.9	2.7	89.0	350.0
09072019	15.07.2019	16:02:01	9564.62	Annen stasjon	768	EK60 survey	3.8	7704.929993 N	03446.269303 E	131.65	0.9	3.4	1.5	88.0	225.2
09072019	15.07.2019	22:33:46	9589.85	CTD med vannhenter START	769		0.7	7703.872358 N	03452.648606 E	129.42	1.1	1.7	2.8	85.9	237.8
09072019	15.07.2019	22:45:46	9589.94	CTD med vannhenter STOPP	769		0.3	7703.834735 N	03452.925969 E	130.02	1.0	2.6	3.3	86.2	234.9
09072019	15.07.2019	23:13:13	9590.77	CTD med vannhenter START	770		0.8	7704.031110 N	03451.623911 E	130.03	1.0	2.4	2.9	83.4	244.8
09072019	15.07.2019	23:24:57	9590.84	CTD med vannhenter STOPP	770		0.5	7704.036200 N	03451.658851 E	129.98	1.1	2.3	1.2	82.5	224.2
09072019	15.07.2019	23:47:54	9591.41	CTD med vannhenter START	771		0.4	7704.334741 N	03449.618554 E	130.04	1.0	2.7	2.9	81.8	212.2
09072019	15.07.2019	23:59:31	9591.50	CTD med vannhenter STOPP	771		0.6	7704.369788 N	03449.825182 E	129.60	1.2	2.5	2.1	81.9	211.8

CruiseNr	Date (UTC)	Time (UTC)	Logg (nm)	Stasjonstype	StNr	Kommentar	Speed	Latitude	Longitude	Depth (m)	Air Temp (°C)	Water Temp (°C)	Wind Speed (m/s)	Humidity (%)	Wind dir (deg)
09072019	16.07.2019	00:20:24	9592.06	CTD med vannhenter START	772		0.4	7704.609640 N	03447.845951 E	129.35	1.2	2.8	2.3	82.2	225.2
09072019	16.07.2019	00:32:06	9592.08	CTD med vannhenter STOPP	772		0.1	7704.624463 N	03447.844448 E	129.32	1.2	2.4	2.0	80.7	210.4
09072019	16.07.2019	00:39:13	9592.09	CTD med vannhenter START	772B		0.2	7704.622189 N	03447.841778 E	129.33	1.3	2.4	1.6	80.6	213.4
09072019	16.07.2019	00:50:23	9592.10	CTD med vannhenter STOPP	772B		0.1	7704.626298 N	03447.840999 E	129.19	1.2	3.4	2.4	81.0	215.1
09072019	16.07.2019	01:07:42	9592.63	CTD med vannhenter START	773		0.2	7704.933252 N	03445.903791 E	131.48	1.2	2.6	2.3	81.0	223.2
09072019	16.07.2019	01:19:19	9592.64	CTD med vannhenter STOPP	773		0.1	7704.934104 N	03445.896669 E	131.39	1.2	1.3	2.4	81.1	221.4
09072019	16.07.2019	01:27:05	9592.74	Multibeam survey START	774		5.7	7705.012825 N	03445.583002 E	132.60	1.3	2.6	2.2	81.1	219.1
09072019	16.07.2019	04:04:12	9618.63	Multibeam survey STOPP	774		6.8	7723.146265 N	03322.635408 E	134.50	0.6	2.6	1.8	87.3	36.9
09072019	16.07.2019	04:06:21	9618.76	CTD med vannhenter START	775		1.0	7723.244222 N	03322.304614 E	134.86	0.7	1.7	1.8	87.5	357.8
09072019	16.07.2019	04:14:35	9618.80	CTD med vannhenter STOPP	775		0.5	7723.214807 N	03322.244539 E	135.64	1.6	1.6	1.4	87.0	12.5
09072019	16.07.2019	04:23:41	9619.28	Multibeam survey START	776	Chirp	6.6	7723.504397 N	03321.005061 E	142.84	0.9	1.7	2.4	84.3	34.4
09072019	16.07.2019	05:20:49	9626.63	Multibeam survey STOPP	776	Chirp	7.7	7723.463533 N	03322.157363 E	140.13	1.0	1.4	0.8	83.8	197.2
09072019	16.07.2019	06:49:39	9633.77	Seismisk profil START	777		4.6	7726.382569 N	03329.471973 E	166.64	1.0	1.7	2.2	84.4	146.3
09072019	16.07.2019	09:22:51	9645.30	Seismisk profil STOPP	777		4.5	7719.605860 N	03247.176672 E	152.74	1.3	2.5	0.6	78.6	225.5
09072019	16.07.2019	09:46:10	9646.62	Multibeam survey START	778	+chirp	7.9	7719.534024 N	03243.169519 E	155.82	1.3	2.8	0.8	79.0	316.9
09072019	16.07.2019	15:28:35	9692.37	Multibeam survey STOPP	778	+chirp	5.6	7757.158699 N	03058.497843 E	237.53	-0.9	3.3	2.0	87.1	258.6
09072019	16.07.2019	15:31:41	9692.49	CTD med vannhenter START	779		0.6	7757.156285 N	03058.049452 E	238.84	-0.9	2.1	2.6	87.0	252.2
09072019	16.07.2019	15:42:40	9692.59	CTD med vannhenter STOPP	779		0.6	7757.086500 N	03058.273082 E	236.98	-0.9	2.2	2.0	88.6	251.1
09072019	16.07.2019	15:53:19	9693.61	Multibeam survey START	780	+ chirp	7.9	7757.212319 N	03055.973823 E	249.95	-0.9	1.8	2.3	88.1	265.9
09072019	16.07.2019	21:29:57	9727.76	Multibeam survey STOPP	780	+ chirp	2.7	7732.110379 N	02941.522377 E	203.41	0.1	1.6	1.5	94.4	143.2
09072019	16.07.2019	22:14:39	9729.60	Seismisk profil START	781		4.5	7732.302272 N	02933.373040 E	212.94	0.0	1.9	0.5	94.1	115.2

CruiseNr	Date (UTC)	Time (UTC)	Logg (nm)	Stasjonstype	StNr	Kommentar	Speed	Latitude	Longitude	Depth (m)	Air Temp (°C)	Water Temp (°C)	Wind Speed (m/s)	Humidity (%)	Wind dir (deg)
09072019	17.07.2019	06:26:31	9766.64	Seismisk profil STOPP	781		4.6	7718.332496 N	02748.694208 E	169.26	-0.4	2.9	4.0	95.2	70.2
09072019	17.07.2019	07:50:42	9771.07	Gravity core (GC)	782		0.3	7716.850558 N	02756.202936 E	211.48	-0.1	2.8	4.8	94.8	73.6
09072019	17.07.2019	09:05:00	9775.00	Multibeam survey START	783		7.6	7717.274330 N	02756.207992 E	215.62	-0.3	3.1	5.2	94.2	32.3
09072019	17.07.2019	09:18:02	9776.79	Multibeam survey STOPP	783		6.2	7715.500318 N	02755.744433 E	197.50	0.3	3.0	5.4	94.3	39.6
09072019	17.07.2019	09:40:21	9777.49	Gravity core (GC)	784		0.3	7715.690538 N	02755.755457 E	197.86	0.0	3.4	6.7	93.9	42.8
09072019	17.07.2019	10:41:38	9778.82	Multicorer START	785		0.3	7715.690631 N	02755.784092 E	197.27	-0.2	3.9	7.3	93.4	43.4
09072019	17.07.2019	10:41:46	9778.82	Multicorer STOPP	785		0.4	7715.691062 N	02755.787036 E	197.30	-0.3	4.4	7.2	93.3	41.0
09072019	17.07.2019	12:46:53	9783.17	Multicorer START	786		0.6	7716.246499 N	02759.009477 E	206.14	0.0	3.9	8.9	94.2	42.5
09072019	17.07.2019	12:46:54	9783.17	Multicorer STOPP	786		0.6	7716.246717 N	02759.010190 E	206.13	0.0	4.1	8.9	94.2	43.8
09072019	17.07.2019	13:19:14	9785.31	Multibeam survey START	787	+chirp	9.6	7714.902353 N	02751.927637 E	199.31	0.1	3.9	8.9	93.7	31.9
09072019	17.07.2019	13:54:07	9790.81	Multibeam survey STOPP	787	+chirp	1.3	7711.714531 N	02732.821971 E	217.38	0.3	2.3	10.1	94.3	36.8
09072019	17.07.2019	13:54:55	9790.82	CTD med vannhenter START	788		0.4	7711.713070 N	02732.852546 E	217.21	0.2	2.6	10.0	94.3	38.0
09072019	17.07.2019	14:05:24	9790.88	CTD med vannhenter STOPP	788		0.3	7711.712964 N	02732.623193 E	219.04	0.3	2.5	10.2	94.3	47.1
09072019	17.07.2019	14:52:09	9792.38	Seismisk profil START	789		2.6	7712.498179 N	02738.177650 E	206.38	0.5	2.2	9.2	94.4	27.9
09072019	17.07.2019	16:55:09	9801.42	Seismisk profil STOPP	789		3.9	7718.488812 N	02808.140243 E	194.18	0.5	3.9	13.3	94.0	25.3
09072019	17.07.2019	17:11:38	9801.75	CTD med vannhenter START	790		0.3	7718.799472 N	02808.073575 E	194.59	0.5	3.4	12.3	93.9	22.8
09072019	17.07.2019	17:22:24	9801.82	CTD med vannhenter STOPP	790		0.3	7718.831139 N	02807.816362 E	195.93	0.6	3.2	13.9	93.9	20.4
09072019	17.07.2019	17:25:57	9801.85	Multibeam survey START	791	+ chirp	0.9	7718.810984 N	02807.836248 E	196.21	0.7	3.4	14.6	93.9	17.7
09072019	17.07.2019	22:28:45	9833.51	Multibeam survey STOPP	791	+ chirp	8.1	7726.372564 N	02823.180169 E	167.38	0.5	0.9	13.1	94.9	24.9
09072019	17.07.2019	23:54:48	9845.91	Multibeam survey START	792	+ chirp	8.4	7723.090950 N	02916.652747 E	179.31	1.0	2.8	11.9	95.1	29.0

CruiseNr	Date (UTC)	Time (UTC)	Logg (nm)	Stasjonstype	StNr	Kommentar	Speed	Latitude	Longitude	Depth (m)	Air Temp (°C)	Water Temp (°C)	Wind Speed (m/s)	Humidity (%)	Wind dir (deg)
09072019	18.07.2019	14:29:47	9958.62	Multibeam survey STOPP	792		7.4	7719.384681 N	02912.053754 E	173.91	3.1	2.5	10.7	87.3	256.1
09072019	18.07.2019	00:24:46	9849.39	CTD med vannhenter START	793		0.6	7726.133646 N	02923.935893 E	181.18	1.0	2.4	9.4	95.0	28.5
09072019	18.07.2019	00:34:00	9849.47	CTD med vannhenter STOPP	793		0.4	7726.187884 N	02923.818278 E	183.61	0.9	1.7	9.3	95.0	24.6
09072019	18.07.2019	14:43:03	9959.92	CTD med vannhenter START	794		0.8	7719.382538 N	02906.937435 E	179.56	3.2	2.8	10.3	87.7	239.6
09072019	18.07.2019	14:51:55	9959.98	CTD med vannhenter STOPP	794		0.2	7719.374849 N	02906.684698 E	179.54	3.1	3.1	11.3	88.1	250.7
09072019	18.07.2019	15:18:26	9960.74	Multibeam survey START	795		4.7	7718.856740 N	02906.915564 E	0.00	2.8	2.9	12.7	89.7	253.8
09072019	18.07.2019	18:33:25	9975.09	Multibeam survey STOPP	795		5.1	7717.033744 N	02904.505553 E	0.00	2.3	1.8	15.5	95.5	251.2

CruiseNr	Date (UTC)	Time (UTC)	Logg (nm)	Stasjonstype	StNr	Kommentar	Speed	Latitude	Longitude	Depth (m)	Air Temp (°C)	Water Temp (°C)	Wind Speed (m/s)	Humidity (%)	Wind dir (deg)
09072019	21.07.2019	05:12:05	412.63	CTD med vannhenter START	796		1.0	7832.932717 N	01013.028529 E	96.09	5.1	7.3	7.9	89.9	175.3
09072019	21.07.2019	05:25:11	412.83	CTD med vannhenter STOPP	796		1.0	7833.126324 N	01013.288176 E	92.51	5.1	7.2	9.7	92.2	174.0
09072019	21.07.2019	05:36:33	413.33	Multibeam survey START	797		4.5	7833.180675 N	01011.651123 E	94.71	5.3	7.3	8.9	92.5	160.8
09072019	21.07.2019	06:04:13	415.26	Multibeam survey STOPP	797		4.3	7834.457630 N	01004.476308 E	87.64	5.5	7.4	9.2	92.7	166.1
09072019	21.07.2019	06:15:34	415.78	CTD med vannhenter START	798		0.9	7834.459896 N	01005.142322 E	93.19	5.6	7.2	10.6	93.3	167.0
09072019	21.07.2019	06:24:39	415.82	CTD med vannhenter STOPP	798		0.2	7834.444460 N	01005.235871 E	94.11	5.8	7.4	10.4	93.4	160.5
09072019	21.07.2019	06:39:50	416.65	CTD med vannhenter START	799		1.0	7833.829136 N	01007.683269 E	94.61	5.9	7.3	10.5	93.4	166.7
09072019	21.07.2019	06:50:42	416.70	CTD med vannhenter STOPP	799		0.1	7833.816031 N	01007.723406 E	94.09	6.0	7.4	9.9	93.5	178.7
09072019	21.07.2019	07:22:34	418.48	CTD med vannhenter START	800		1.3	7834.463918 N	01005.193183 E	93.04	6.5	7.2	9.1	88.4	199.6
09072019	21.07.2019	07:33:31	418.57	CTD med vannhenter STOPP	800		0.3	7834.447999 N	01005.408251 E	94.48	6.4	7.4	8.3	88.1	200.5
09072019	21.07.2019	08:03:15	420.27	CTD med vannhenter START	801		1.5	7833.207318 N	01010.470150 E	102.73	5.8	7.3	8.6	91.4	217.0
09072019	21.07.2019	08:11:48	420.35	CTD med vannhenter STOPP	801		0.2	7833.172454 N	01010.651733 E	101.95	5.8	6.9	8.4	92.2	202.8
09072019	21.07.2019	08:59:21	421.89	CTD med vannhenter START	802		1.5	7833.325213 N	01004.670330 E	105.86	6.5	7.5	8.7	85.1	194.4
09072019	21.07.2019	09:10:27	421.95	CTD med vannhenter STOPP	802		0.9	7833.312524 N	01004.464255 E	108.11	6.5	7.5	9.2	85.9	180.7
09072019	21.07.2019	09:19:37	422.55	Multibeam survey START	803		4.8	7833.045349 N	01004.611055 E	115.72	5.7	7.0	8.8	88.8	207.9
09072019	21.07.2019	09:45:46	424.43	Multibeam survey STOPP	803		4.1	7834.462182 N	01010.812230 E	98.31	6.0	7.3	10.3	89.6	185.3
09072019	21.07.2019	10:05:02	424.94	CTD med vannhenter START	804		1.0	7834.340496 N	01011.108349 E	100.29	6.4	7.3	9.8	88.0	192.1
09072019	21.07.2019	10:16:45	425.05	CTD med vannhenter STOPP	804		0.6	7834.343087 N	01011.020288 E	97.45	6.1	7.4	9.3	88.8	200.5
09072019	21.07.2019	10:34:11	426.60	Multibeam survey START	805		4.0	7833.319742 N	01008.879175 E	107.65	6.7	7.7	8.8	86.8	198.9
09072019	21.07.2019	12:41:27	434.14	Multibeam survey STOPP	805		0.8	7834.366254 N	01007.464607 E	86.62	6.3	6.6	10.5	85.9	208.4
09072019	21.07.2019	13:08:40	434.95	Multibeam survey START	805B	cont.	4.0	7834.155044 N	01007.391038 E	85.70	6.2	7.5	10.3	88.5	221.7
09072019	21.07.2019	15:12:03	442.09	Multibeam survey STOPP	805B	cont.	4.2	7834.038553 N	01006.830142 E	85.91	5.8	7.5	8.9	88.0	211.4
09072019	21.07.2019	15:23:43	442.83	Annen stasjon	806	EK60 survey	4.6	7833.923476 N	01007.848760 E	95.28	5.6	7.2	11.1	89.3	219.3
09072019	21.07.2019	21:15:59	467.00	Multibeam survey START	807		7.7	7832.282327 N	01021.649170 E	108.65	5.5	6.9	6.2	89.7	214.2

CruiseNr	Date (UTC)	Time (UTC)	Logg (nm)	Stasjonstype	StNr	Kommentar	Speed	Latitude	Longitude	Depth (m)	Air Temp (°C)	Water Temp (°C)	Wind Speed (m/s)	Humidity (%)	Wind dir (deg)
09072019	22.07.2019	11:10:23	579.91	Multibeam survey STOPP	807		8.3	7830.941795 N	01013.824473 E	130.89	6.5	7.1	5.7	93.2	215.1
09072019	22.07.2019	14:32:29	584.13	Annen stasjon	808	Lander deployed	0.7	7833.794030 N	01008.100774 E	93.95	6.4	8.2	2.0	91.2	292.6
09072019	22.07.2019	15:20:08	586.84	Multibeam survey START	809		4.6	7833.371737 N	01008.532269 E	106.43	6.7	7.0	2.5	89.7	285.5
09072019	22.07.2019	18:25:47	600.34	Multibeam survey STOPP	809		4.1	7834.021533 N	01006.915463 E	85.59	6.7	7.4	1.6	88.9	335.3
09072019	22.07.2019	18:39:58	601.04	CTD med vannhenter START	810		0.9	7833.806602 N	01008.125747 E	93.69	6.7	6.8	2.4	88.1	346.5
09072019	22.07.2019	18:49:50	601.09	CTD med vannhenter STOPP	810		0.4	7833.781598 N	01008.127812 E	93.59	6.3	7.3	2.2	89.1	352.9
09072019	22.07.2019	19:13:46	601.94	Annen stasjon	811	EK60	4.8	7833.664595 N	01008.794088 E	88.31	6.3	7.4	2.0	89.4	34.8

Appendix A

Proforma invoices and custom declarations

Receiver:
Norsk Polarinstitutt Forskningsparken
Postboks 5059171
Longyearbyen, Svalbard
Geir Ove Aasnes, Tel: +4779023302
geir.ove.aasnes@npolar.no

Sender:
Centre for Arctic Gas Hydrate, Environment and Climate, UiT – The Arctic University of Norway;
Department for Geology
N-9037, Tromsø, Norway
Pär Jansson, Tel: +47 95077395
per.a.jansson@uit.no

Proforma invoice, temporary export Date: 17.06.2019

Partly assembled system for stationary ocean observations. The observatory/ lander will be shipped to Svalbard with RV Helmer Hanssen, equipped with further instruments, deployed offshore Svalbard and returned to CAGE/UiT, Tromsø after one year. Additional sensors and control units will be mounted on the Lander when returned.

Item	Qty. Unit	Description	Value EURO
		- **Frame and infrastructure for instruments:**	
1	1	Transport frame on wheels	
2	1	Kongsberg Lander S/N: KL30-1505-002	
2	1	- **Instruments mounted on the infrastructure at the time of shipment:**	
2	1	Contros CH4, S/N: CH4P-1214-004	
2	1	Contros CO2, S/N:CO2-1214-003	
2	1	PMU, S/N:PMU-0515-001	
2	1	PMU, S/N:PMU-0515-002	
2	1	ADCP, S/N:2257	
2	1	cNODE, S/N:14083	
2	1	cNODE, S/N:14083	
2	1	Recovery buoy system	
2	20	Batteries	
		- **Instruments to be mounted in Longyearbyen.** Preliminary serial numbers subject to change. These instruments are not included in this shipment, but will be returned together with the above:	
...	7	SeapHOx S/N:xxxxx; Flowmeter, S/N: 21800; DPU, S/N:DPU-1214-002; icListen Hydrophone, S/N:1504; SKL, S/N:14135116; CTD, S/N:16-50089; Flowmeter, S/N:3744	
			400.000

Package weights and outer dimensions (width x depth x height) and weight:

#	Package	Dimension	Weight
1	Steel transport frame on wheels	360 x 360 x 50 cm	150 kg
2	Free standing lander with mounted sensors/ instruments	360 x 360 x 150 cm	2500 kg

No dangerous goods contained

Centre for Arctic Gas Hydrate, Environment and Climate, UiT – The Arctic University of Norway
Department for Geology, N-9037, Tromsø, Norway
Pär Jansson, Tel: +47 95077395
per.a.jansson@uit.no

Receiver:
Norsk Polarinstitutt Forskningsparken
Postboks 5059171 Longyearbyen
Svalbard
Geir Ove Aasnes, Tel: 79 02 55 03
geir.ove.aasnes@npolar.no

Sender:
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Department for Geology
N-9037, Tromsø, Norway
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Pro forma invoice, temporary export Date: 17.06.2019

Loaned launcher system for deployment of K-Lander. Shipped with RV Helmer Hanssen from Tromsø. Will Arrive in Longyearbyen for preparation on land 28.06.19. Brought back on Helmer Hanssen 09.07.19. Launcher will be returned by RV Helmer Hanssen to CAGE/UiT late July or August 2019.

Item	Qty. Unit	Description	Value EURO
1	1 pcs	Launcher system for Kongsberg Lander Description: Scientific devices - 1 releaser unit (SN: 2G)	
2	1 pcs	- Telemetry system by Kongsberg Maritime Embient GmbH (SN: KLTE-1409-002) - altimeter by Valeport (SN: 56606), 1 camera, cables and smaller accessories, power supply, - battery charger	
3	1 pcs	2 LED monitor by Medion and cables associated with them	
4	1 pcs	- Pole for camera and light (metal tube),	
total			55.000

Package weights and outer dimensions (width x depth x height) and weight:

#	Package	Dimension	Weight
1	Wooden box	150 x 150 x 120 cm	420 kg
2	Brown wooden box	120 x 45 x 55 cm	90 kg
3	Brown wooden box	95 x 45 x 55 cm	40 kg
4	Steel pole, attached to #1	205 x diam. 10 cm	10 kg

No dangerous goods contained

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Department for Geology, N-9037, Tromsø, Norway
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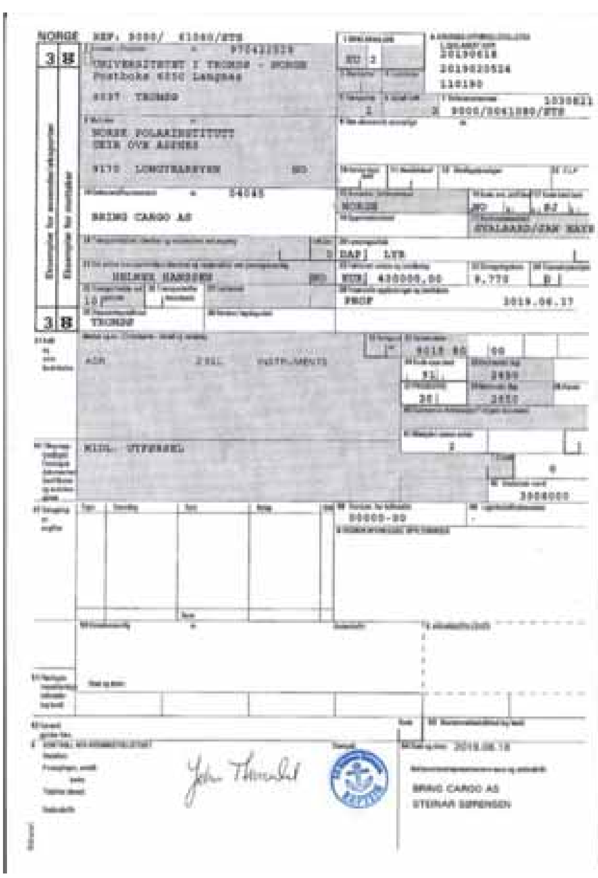

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Postboks 6050 Langnes
9037 TROMSØ
NORSK POLARINSTITUTT
GEIR OVE AASNES
9170 LONGYEARBYEN NO
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BRING CARGO AS
HELMER HANSSEN NO
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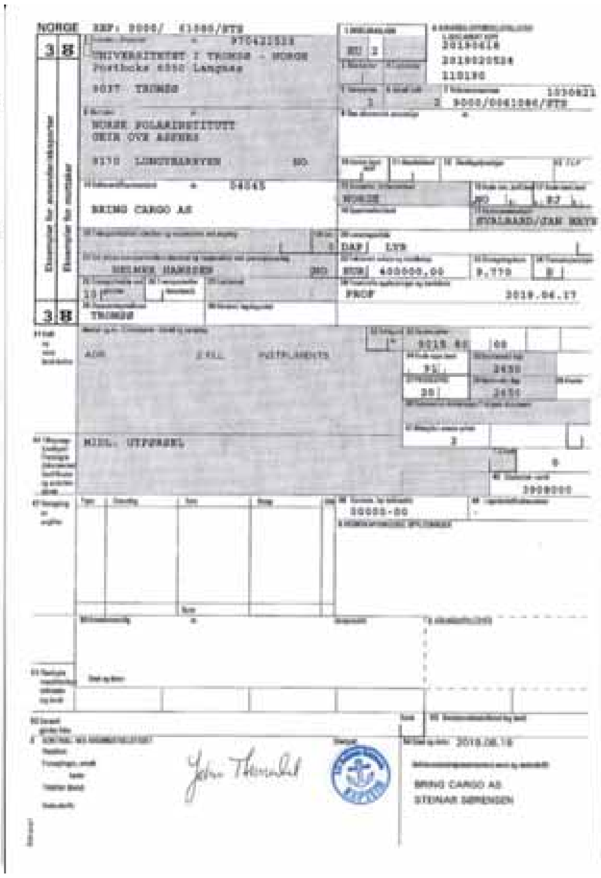

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UNIVERSITETET I TROMSØ - NORGE
Postboks 6050 Langnes
9037 TROMSØ
NORSK POLARINSTITUTT
GEIR OVE AASNES
9170 LONGYEARBYEN NO
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BRING CARGO AS
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